ACUSON

QV3000

DICOM Conformance Statement

Revision: 1.1

Revision History

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1. Introduction

1.1 Purpose of this Document

This document is a provisional DICOM Conformance Statement for the QV3000 System.

The following DICOM services are documented and supported by QV3000:

- QV3000 as Storage SCU
- QV3000 as Storage SCP
- QV3000 as Storage Commitment SCU
- QV3000 as Query SCU
- QV3000 as Retrieve SCU
- QV3000 as Print SCU
- QV3000 as Modality Worklist Management SCU
- QV3000 as Media Storage File Set Creator (FSC)
- QV3000 as Media Storage File Set Reader (FSR)
- QV3000 as Media Storage File Set Updater (FSU)

1.2 Sources for this Document

- ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) v3.0, 1998, 1999

1.3 Acronyms and Abbreviations

The following acronyms and abbreviations are used in this document.

- ACR — American College of Radiology
- ANSI — American National Standards Institute
- DICOM — Digital Imaging and Communications in Medicine
- DIMSE — DICOM Message Service Element
- DIMSE-C — DICOM Message Service Element-Composite
- DIMSE-N — DICOM Message Service Element-Normalized
- FSC — File Set Creator
- FSR — File Set Reader
- FSU — File Set Updater
- HIS — Hospital Information System
- IM — Information Model
- MOD — Magneto-Optical Disk
- NEMA — National Electrical Manufacturers Association
- PDU — Protocol Data Unit
- RIS — Radiology Information System
- SCP — Service Class Provider
- SCU — Service Class User
- SOP — Service Object Pair
- TCP/IP — Transmission Control Protocol/Internet Protocol
- UID — Unique Identifier

2. Implementation Model

QV3000 can store images to remote DICOM SCPs, issue Storage commitment request to DICOM SCPs, print images to remote DICOM printers, send study management services as a SCU and perform basic worklist management.

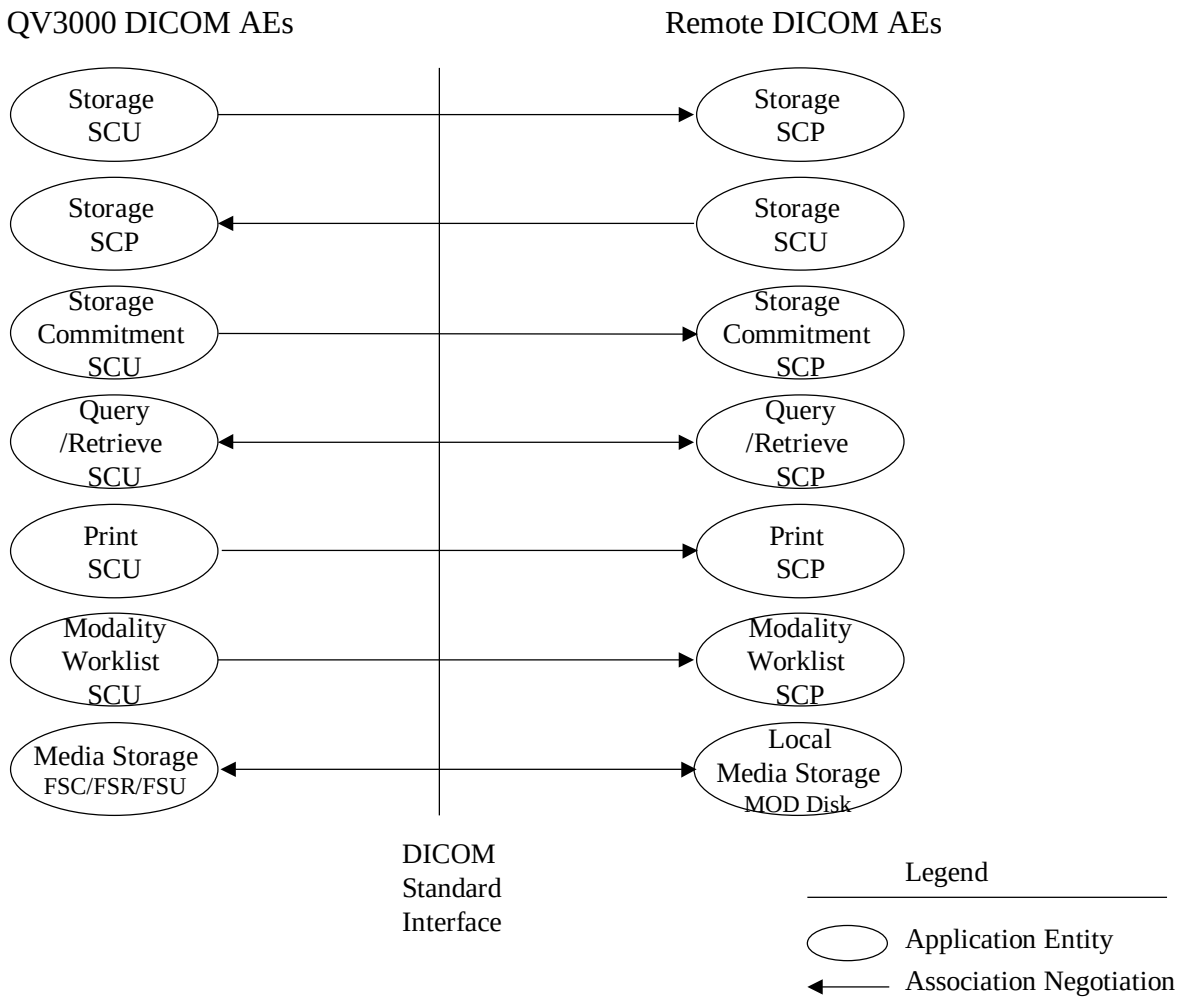
The system can also query a remote SCP for a patient study for review. This process uses the SCP functionality of the QV3000.

The system can also create, read or update DICOM compliant removable media.

2.1 Application Data Flow Diagram

Figure 1 shows relationships between QV3000 Application Entities and remote DICOM Application Entities. DICOM Media storage relationship is also illustrated.

FIGURE 1: QV3000 APPLICATION DATA FLOW DIAGRAM



2.2 Functional Definitions of Application Entities

2.2.1 Image Storage as a SCU

QV3000 is a service class user (SCU) for the DIMSE-C services for the storage of images to a remote DICOM SCP.

2.2.2 Image Storage as a SCP

QV3000 can receive DICOM images. The images are incorporated into the internal database as part of a patient study. The images can then be reviewed on the monitor of the host machine.

2.2.3 Storage Commitment as a SCU

QV3000 is capable of being an SCU to issue storage commitment request to a remote DICOM SCP.

2.2.4 Query as a SCU

QV3000 can send query requests to retrieve patient, study, series, and image information from a remote DICOM SCP.

2.2.5 Retrieve as a SCU

QV3000 can send retrieve requests to retrieve study images directly from a remote DICOM SCP.

2.2.6 Basic Printing as a SCU

QV3000 is capable of being an SCU for printing DICOM images.

2.2.7 Basic Worklist Management

QV3000 is capable of being an SCU for retrieving basic worklist management information from a HIS SCP.

2.2.8 Media Storage

QV3000 can act as a File Set Creator (FSC), to initialize MOD media and create a DICOM File-set on the media.

QV3000 can act as a File Set Reader (FSR), to access one or more files on a File-set on MOD media.

QV3000 can act as a File Set Updater (FSU), to add additional files or delete existing files on a DICOM File-set on MOD media

3. AE Specifications

3.1 QV3000 Specifications

3.1.1 Storage as a SCU

QV3000 provides Standard Conformance to the following (Table 1) DICOM V3.0 Storage SOP Classes as a SCU.

Table 1 Storage SOP Classes

SOP Class	SOP Class UID
Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Structured Reporting (SR) Detailed Storage	1.2.840.10008.5.1.4.1.1.88.3

3.1.2 Storage as a SCP

QV3000 provides Standard Conformance to the above (Table 1) DICOM V3.0 Storage SOP Classes as a SCP.

3.1.3 Storage Commitment as a SCU

QV3000 provides Standard Conformance to DICOM V3.0 Storage Commitment SOP Class listed in Table 2 as an SCU.

Table 2 Storage Commitment SOP Class

SOP Class	SOP Class UID
Storage Commitment Push Model	1.2.840.10008.1.20.1

3.1.4 Query/Retrieve as a SCU

QV3000 provides Standard Conformance to the following (Table 3) DICOM V3.0 Query/Retrieve SOP Classes as a SCU.

Table 3 Query/Retrieve SOP Classes

SOP Class	SOP Class UID
Patient/Study Only Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.3.2

3.1.5 Detached Study Management as a SCU

QV3000 provides Standard Conformance to the following (Table 4) DICOM V3.0 Detached Study Management SOP Classes as a SCU.

Table 4 Detached Study Management SOP Classes

SOP Class	SOP Class UID
Detached Study Management	1.2.840.10008.3.1.2.3.1

3.1.6 Print as a SCU

QV3000 provides Standard Conformance to the following (Table 5) DICOM V3.0 Print Management SOP Classes as a SCU.

Table 5 Detached Print Management SOP Classes

SOP Class	SOP Class UID
Basic Greyscale Print Management Meta	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18

Note:

- Support for Basic Greyscale Print Management Meta SOP Class includes by definition support for Preformated Greyscale Image SOP Class, Basic Film Session, Basic Film Box, Basic Image Box, Printer SOP Class.

- Support for Basic Color Print Management Meta SOP Class includes by definition support for Preformatted Color Image SOP Class, Basic Film Session, Basic Film Box, Basic Image Box, Printer SOP Class.

3.1.7 Modality Worklist Management as a SCU

QV3000 provides Standard Conformance to the following (Table 6) DICOM V3.0 Basic Worklist Management SOP Class as a SCU.

Table 6 Basic Worklist Management SOP Classes

SOP Class	SOP Class UID
Modality Worklist IM Find	1.2.840.10008.5.1.4.31

3.1.8 Media Storage as a SCU

QV3000 provides Standard Conformance to the following (Table 7) DICOM V3.0 interchange option Media Storage classes.

Table 7 Media Storage Application Profiles

Supported APs	Real World Activity	Role
STD-US-ID-MF-MOD128/230/540/640	Create MOD Update MOD Read MOD	FSC FSU FSR

3.2 Association Establishment Policies

3.2.1 General

QV3000 contains no limitations for maximum PDU size. Default maximum PDU size is set to 100 Kb but can be modified by service user.

3.2.2 Asynchronous Nature

QV3000 allows a single outstanding operation on any association. Therefore, QV3000 does not support asynchronous operations window negotiation, other than the default as specified by the DICOM specification.

3.2.3 Implementation Identifying Information

QV3000 will respond with the following implementation identifying parameters:

- Implementation Class UID **`1.2.124.113532.1.1`**
- Implementation Version Name **`QV3000 + <Software version>`**

The implementation version name policies are the following: product name "**`QV3000`**" followed by version of the product.

3.2.4 Called/Calling Titles

The default Calling Title that QV3000 will use is the host name of the computer. The Calling Title and Called Titles can be configured via the DICOM Administrator GUI. QV3000 is configured to validate the Called Title of requested SCP during association negotiation.

3.3 Association Initiation by Real World Activity

3.3.1 Real World Activity - Storage

3.3.1.1 Associated Real World Activity - Storage

QV3000 will issue a **Storage** request when a user of QV3000 wishes to send a study of images to a remote DICOM SCP.

3.3.1.2 Presentation Contexts - Storage

QV3000 supports the transfer syntaxes listed in Table 8, with SOP classes listed in Table 9.

Table 8 Storage Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1
DICOM Lossy JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
DICOM RLE Lossless	1.2.840.10008.1.2.5

Table 9 Storage SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	**SOP Class UID**			
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	all from Table 8	SCP/SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	all from Table 8	SCP/SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	all from Table 8	SCP/SCU	None
Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	all from Table 8	SCP/SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	all from Table 8	SCP/SCU	None
Structured Reporting (SR) Detailed Storage	1.2.840.10008.5.1.4.1.1.88.3	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP/SCU	None

3.3.2 Real World Activity - Storage Commitment

3.3.2.1 Associated Real World Activity - Storage Commitment

QV3000 will issue a Storage Commitment request when a user of QV3000 wishes to commit studies/images storage to a remote DICOM SCP.

3.3.2.2 Proposed Presentation Contexts - Storage Commitment

QV3000 supports the following transfer syntax (Table10) and Presentation Contexts (Table11) for **Storage Commitment**.

Table 10 Storage Commitment Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1

Table 11 Storage Commitment SOP Class

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	**SOP Class UID**			
Storage Commitment Push Model	1.2.840.10008.1.20.1	all from Table 10	SCU	None

3.3.2.3 SOP Specific Conformance - Storage Commitment

QV3000 issues storage commitment request (N-ACTION) of related study images to a remote storage commitment SCP, then through QV3000 SCP it waits for storage commitment N-EVENT-REPORT to confirm commitment of the study images.

3.3.3 Real World Activity - Query/Retrieve

3.3.3.1 Associated Real World Activity - Query/Retrieve

QV3000 issue a Query request when a user of QV3000 wishes to query and retrieve an information from a remote DICOM SCP.

3.3.3.2 Proposed Presentation Contexts - Query/Retrieve

QV3000 supports the transfer syntaxes listed in Table 12, and SOP classes listed in Table 13 for **Query/Retrieve**.

Table 12 Query/Retrieve Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1

Table 13 Query/Retrieve SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	**SOP Class UID**			
Patient/Study Only Query/Retrieve IM Find	1.2.840.10008.5.1.4.1.2.3.1	all from Table 12	SCU	None
Patient/Study Only Query/Retrieve IM Move	1.2.840.10008.5.1.4.1.2.3.2	all from Table 12	SCU	None

3.3.3.3 SOP Specific Conformance – Find

QV3000 issues C-Find to a remote SCP and requests specified patient/study information. Table 14 shows details of Find requests:

Table 14 Patient/Study Only Query/Retrieve Information Model

	Attribute Name	Tag
Patient Level	Patient Name	(0010, 0010)
	Patient ID	(0010, 0020)
Study Level	Study Date	(0008, 0020)
	Study Time	(0008, 0030)
	Accession Number	(0008, 0050)
	Study ID	(0020, 0010)
	Study Instance UID	(0020, 000D)
	Referring Physician's Name	(0008, 0090)
	Study Description	(0008, 1030)
	Number of Study Related Instances	(0020, 1208)

3.3.3.4 SOP Specific Conformance - Move

QV3000 issues C-Move command to remote SCP, which then sends requested study images back to QV3000.

3.3.4 Real World Activity - Detached Study Management

3.3.4.1 Associated Real World Activity - Detached Study Management

QV3000 will issue an **N-Get** request to retrieve information from a remote HIS SCP.

3.3.4.2 Presentation Context Table - Detached Study Management

QV3000 supports the transfer syntaxes listed in Table 15. For an **N-Get** request, QV3000 supports the Presentation Contexts listed in Table16.

Table 15 Detached Study Management Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1
DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2

Table 16 Detached Study Management SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Detached Study Management	1.2.840.10008.3.1.2.3.1	all from Table 15	SCU	None

3.3.4.3 SOP Specific Conformance - Detached Study Management

All DICOM attributes associated with the Detached Study may be retrieved.

3.3.5 Real World Activity - Basic Worklist Management

3.3.5.1 Associated Real World Activity - Basic Worklist Management

QV3000 will issue a **C-Find** request to retrieve information from a remote HIS SCP.

3.3.5.2 Presentation Context Table - Basic Worklist Management

QV3000 supports the transfer syntaxes listed in Table 17. For a **C-Find** request, QV3000 supports the Presentation Contexts listed in Table 18.

Table 17 Worklist Management Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1
DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2

Table 18 Basic Worklist Management SOP Classes

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Modality Worklist IM Find	1.2.840.10008.5.1.4.31	From Table 17	SCU	None

3.3.5.3 SOP Specific Conformance - Basic Worklist Management

All DICOM attributes associated with the Modality Worklist may be retrieved.

3.3.6 Real World Activity - Printing

3.3.6.1 Associated Real World Activity - Printing

QV3000 will issue Print Management requests to a SCP supporting the DICOM V3.0 Print services, in order to produce hard copy representations of DICOM images.

3.3.6.2 Presentation Context Table - Printing

QV3000 supports the following transfer syntaxes listed in Table 19. QV3000 will accept any of the Presentation Contexts listed in Table 20 for Print Management.

Table 19 Printing Transfer Syntaxes

Transfer Syntax	UID
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2

Table 20 Printing Presentation Contexts

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
SOP Class	SOP Class UID			
Basic Film Session	1.2.840.10008.5.1.1.1	from Table 20	SCU	None
Basic Film Box	1.2.840.10008.5.1.1.2	from Table 20	SCU	None
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	from Table 20	SCU	None
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	from Table 20	SCU	None
Printer	1.2.840.10008.5.1.1.16	from Table 20	SCU	None

3.3.6.3 SOP Specific Conformance - Printing

QV3000 provides standard conformance to the DICOM **Printing** Service Classes by supporting a number of distinct Service classes described below.

3.3.6.3.1 SOP Specific Conformance to Basic Film Session SOP Class

QV3000 issues the following DIMSE-N commands for the Basic Film Session SOP Class:

- N-Create
- N-Action

3.3.6.3.2 SOP Specific Conformance to Basic Film Box SOP Class

QV3000 issues the following DIMSE-N commands for the Basic Film Session SOP Class:

- N-Create
- N-Delete
- N-Action

QV3000 supports only STANDARD formats (STANDARD\1,1; STANDARD\2,2, etc.) with details dependent upon the resolution and capabilities of printer.

3.3.6.3.3 SOP Specific Conformance to Basic Greyscale Image Box SOP Class

QV3000 issues the following DIMSE-N commands for the Basic Greyscale Image Box SOP Class:

- N-Set

3.3.6.3.4 SOP Specific Conformance to Printer SOP Class

QV3000 issues the following DIMSE-N commands for the Printer SOP Class:

- N-Set

3.3.6.3.5 SOP Specific Conformance to Basic Greyscale Print Management Meta SOP Class

The Meta SOP class is supported at negotiation, but is not implemented as the individual SOP classes defined by the DICOM specification.

3.3.7 Real World Activity – Removable Media

A DICOM conformant Magneto-Optical Disk (MOD) is created when a non-conformant MOD is inserted into the QV3000 and one or more DICOM Exams are transferred to the MOD. When Exams are first transferred, their files are added to the MOD in DICOM Part 10 format and a valid DICOMDIR is created and saved to the MOD. The QV3000 can add images to an existing DICOM conformant MOD and update its DICOMDIR. The QV3000 can be a File-set Reader and a File-set Updater.

3.3.7.1 Presentation Contexts – Removable media

Table 21 list applies when the QV3000 is configured to support DICOM Removable Media:

Table 21. Abstract and Transfer Syntaxes for Media Storage

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
DICOM Media Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6 (retired) 1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
		RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Lossy, Baseline (Process 1)	1.2.840.10008.1.2.4.50
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3 (retired) 1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
		RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Lossy, Baseline (Process 1)	1.2.840.10008.1.2.4.50
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
		RLE Lossless Image Compression	1.2.840.10008.1.2.5
		JPEG Lossy, Baseline (Process 1)	1.2.840.10008.1.2.4.50
SR Detailed Storage	1.2.840.10008.5.1.4.1.1.88.3	Explicit VR Little Endian	1.2.840.10008.1.2.1

3.3.7.2 Photometric Interpretation and Transfer Syntax Pairs

Table 22 shows defined photometric interpretation and transfer syntax pairs supported by QV3000 Media Storage.

Table 22. Defined Photometric Interpretation and Transfer Syntax Pairs

Photometric Interpretation Value	Transfer Syntax	Transfer Syntax UID
MONOCHROME2	Uncompressed	1.2.840.10008.1.2.1
MONOCHROME2	RLE Lossless Image Compression	1.2.840.10008.1.2.5
MONOCHROME2	JPEG Lossy	1.2.840.10008.1.2.4.50
RGB	Uncompressed	1.2.840.10008.1.2.1
RGB	RLE Lossless Image Compression	1.2.840.10008.1.2.5
YBR_FULL	Uncompressed	1.2.840.10008.1.2.1
YBR_FULL	RLE Lossless Image Compression	1.2.840.10008.1.2.5
YBR_FULL_422	Uncompressed	1.2.840.10008.1.2.1
YBR_FULL_422	JPEG Lossy	1.2.840.10008.1.2.4.50

4. Communications Profiles

QV3000 provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.1 TCP/IP Stack

QV3000 inherits its TCP/IP stack from the computer system upon which it executes.

4.1.1 Physical Media Support

QV3000 is indifferent to the physical medium over which TCP/IP executes; it inherits the medium from the computer system upon which it executes.

5. Configuration

QV3000 obtains configuration information from the following sources:

- Mapping from Application Entity Title to Presentation Address is provided by the database.
- Configuration table stores Application Entity Title, default PDU size, and preferred byte orders for the SOP classes that QV3000 supports.

6. Support for Extended Character Sets

QV3000 is known to support the following character sets:

- ISO-IR 6 (default) Basic G0 Set
- ISO-IR 100 Latin Alphabet No. 1

7. SCU behavior

If the C-STORE operation is successful, the status changes to "A" in the status column on the patient list.

If the C-STORE operation is unsuccessful, a "NETWORK FAILURE" message appears on the video monitor. The "cancel" button must then be pressed to continue normal operation. The status changes to "W" in the status column on the patient list.

No extended negotiation is supported.

8. SCP behavior

A patient study can be retrieved for review on the host machine. The retrieval process issues a command to a remote DICOM SCP to C-MOVE a requested study to the QV3000 unit. The SCP agent on the QV3000 accepts the images and inserts the information into the local database on the system.

9. DICOM fields in the DICOM image files

Table 23 lists common DICOM tags that are used in Storage Class. Other DICOM tags can be incorporated through QV3000 Configuration file.

Table 23 DICOM Tags Used in Storage Class.

Field Name	Tag	Contents
Group Length	0x0002,0x0000	
File Meta Information Version	0x0002,0x0001	
Media Stored SOP Class UID	0x0002,0x0002	
Media Stored SOP Instance UID	0x0002,0x0003	
Transfer Syntax UID	0x0002,0x0010	
Implementation Class UID	0x0002,0x0012	
Implementation Version Name	0x0002,0x0013	
Source Application Entity Title	0x0002,0x0016	
specific_character_set	0x0008,0x0005	ISO_IR 100
sop_class_uid	0x0008,0x0016	
sop_instance_uid	0x0008,0x0018	
study_date	0x0008,0x0020	
study_time	0x0008,0x0030	
accession_number	0x0008,0x0050	
modality	0x0008,0x0060	US
conversion_type	0x0008,0x0064	DV
manufacturer	0x0008,0x0070	
Institute Name	0x0008,0x0080	
referring_physician_name	0x0008,0x0090	
station_name	0x0008,0x1010	
patient_name	0x0010,0x0010	
patient_id	0x0010,0x0020	
patient_birth_date	0x0010,0x0030	
patient_sex	0x0010,0x0040	
study_instance_uid	0x0020,0x000d	
series_instanc_uid	0x0020,0x000e	
study_id	0x0020,0x0010	
series number	0x0020,0x0011	
image_number	0x0020,0x0013	
image_comments	0x0029,0x4000	
samples_per_pixel	0x0028,0x0002	3 or 1
photometric_interpretation	0x0028,0x0004	RGB, MONOCHROME2, YBR_FULL, YBR_FULL_422
planar_configuration	0x0028,0x0006	1 or 0
rows	0x0028,0x0010	
columns	0x0028,0x0011	
bits_allocated	0x0028,0x0100	8
bits_stored	0x0028,0x0101	8
high_bit	0x0028,0x0102	7
pixel_representation	0x0028,0x0103	0
pixel data	0x7fe0,0x0010	