No.MIICT0019EA

TOSHIBA

DICOM
CONFORMANCE STATEMENT
STORAGE (SCU/SCP)
QUERY/RETRIEVE (SCU)
FOR
IMAGE PROCESSING SYSTEM : TIWS-001A
IMAGE PROCESSING SOFTWARE : TIWS-001B
ALATOVIEW
(MIICT0019EA)

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(2) The contents of this manual are subject to change without prior notice and without our legal obligation.

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Table of Contents

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1 Introduction

This document is a DICOM Conformance Statement for Toshiba ALATOVIEW(V1.10 or later). It is intended to provide the reader with the knowledge of how to integrate this product within a DICOM compliant hospital network. It details the DICOM Service Classes, Information Objects, and Communication Protocols which are supported by this product.

If the reader is unfamiliar with DICOM, it is recommended that they read the DICOM Specification (referenced below) prior to reading this conformance statement. Also note that this document is formatted according to the DICOM Specification, Part 2: Conformance.

1.1 References

- ACR-NEMA Digital Imaging and Communications in Medicine, DICOM V3.0.

1.2 Definitions

- **Association Establishment** - An Association Establishment is the first phase of communication between two DICOM Application Entities. The AEs use the Association Establishment to negotiate how data will be encoded and the type of data to be exchanged.
- **Called Application Entity Title** - The Called AE Title defines the intended receiver of an Association.
- **Calling Application Entity Title** - The Calling AE Title defines the requestor of an Association.
- **DICOM Message Service Element (DIMSE)** - A DIMSE defines the services and protocols utilized by an Application Entity to exchange messages.
- **Information Object Definition (IOD)** - An IOD is a data model which is an abstraction of real-world information. This data model defines the nature and attributes relevant to the class of real-world objects represented.
- **Service Class Provider (SCP)** - A Service Class Provider plays the "server" role to perform operations and invoke notifications during an Association. An example of a Storage Service Class Provider would be an image storage device. In this case, the image storage device is storing the image that was sent by a Service Class User.
- **Service Class User (SCU)** - A Service Class User plays the "client" role to invoke operations and perform notifications during an Association. An example of a Storage Service Class User would be an image acquisition device. In this case, the image acquisition device will create and send a DICOM image by requesting that a Service Class Provider store that image.
- **Service/Object Pair (SOP) Class** - A SOP Class is defined by the union of an Information Object Definition and a set of DIMSE Services. A DICOM Application Entity may support one or more SOP Classes. Each SOP Class is uniquely identified by a SOP Class UID.
- **SOP Instance** - A specific occurrence of a Information Object.
- **Transfer Syntax** - The Transfer Syntax is a set of encoding rules that allow DICOM Application Entities to negotiate the encoding techniques (e.g. data element structure, byte ordering, compression) they are able to support. The Transfer Syntax is negotiated during Association Negotiation.

- **Unique Identifier (UID)** - A Unique Identifier is a globally unique, ISO compliant, ASCII-numeric string. It guarantees uniqueness across multiple countries, sites, vendors and equipment.

1.3 Acronyms, Abbreviations and Symbols

- ACC American College of Cardiology
- ACR American College of Radiology
- ASCII American Standard Code for Information Interchange
- AE Application Entity
- ANSI American National Standards Institute
- CEN TC251 Comite Europeen de Normalisation - Technical Committee 251 - Medical Informatics
- 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
- HIS Hospital Information System
- HL7 Health Level 7
- IE Information Entity
- IOD Information Object Definition
- ISO International Standards Organization
- JIRA Japan Industries Association of Radiological Systems
- NEMA National Electrical Manufacturers Association
- OSI Open Systems Interconnection
- 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

2.1 Application Data Flow Diagram

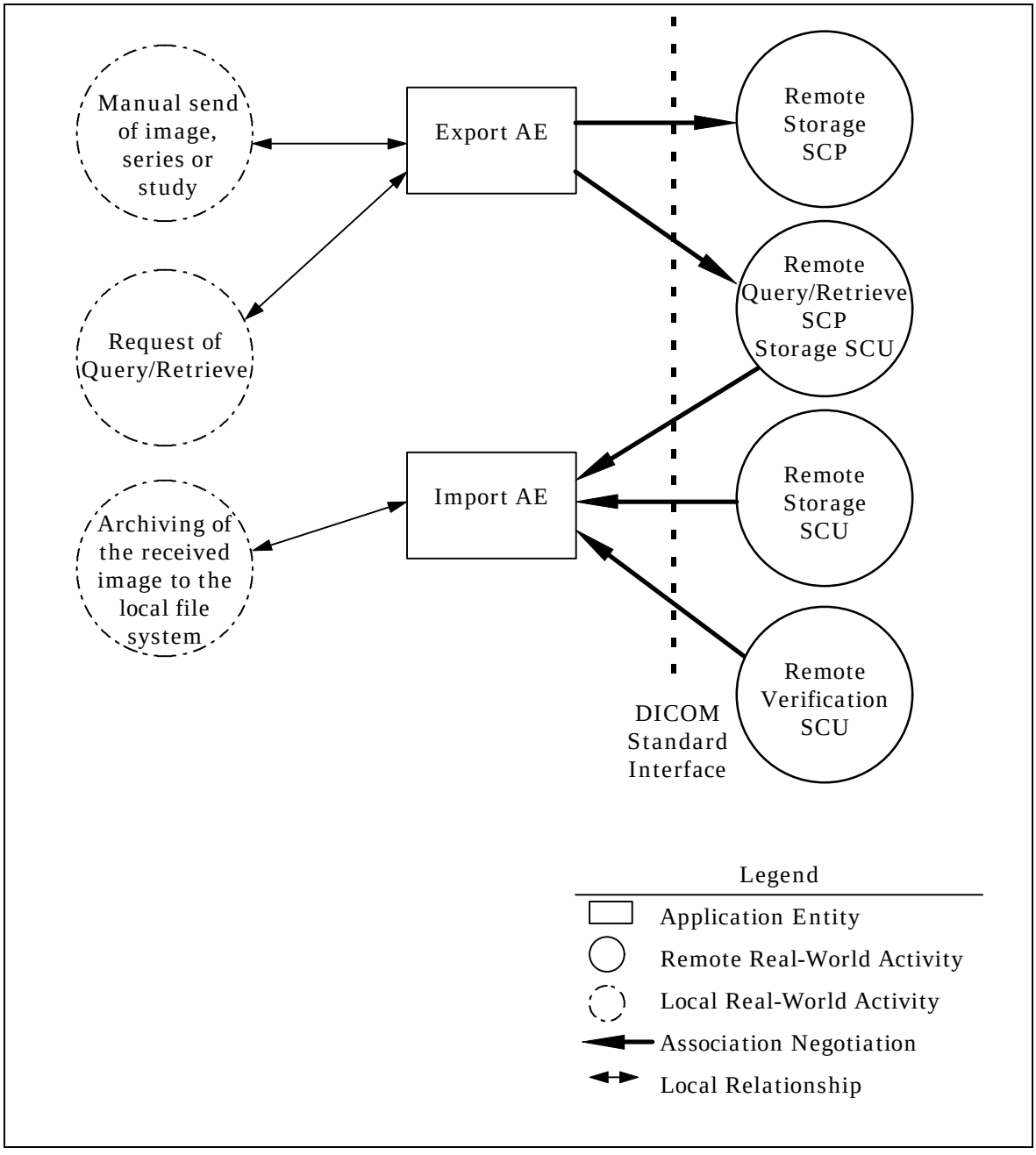

Figure 1

2.2 Functional Definitions of AE's

2.2.1 Export AE

Export AE is used to verify that a remote DICOM device is active on the network, to transmit images to a remote DICOM device, and to transmit Query and Retrieve requests to a remote DICOM device. It therefore performs the following tasks:

- Builds DICOM CT, MR and SC Information Objects
- Establishes DICOM Association with remote DICOM device
- Performs storage of DICOM CT, MR and SC Information Objects to remote DICOM device
- Performs request of Query/Retrieve to remote DICOM device
- Performs verification of remote DICOM device's presence on network

2.2.2 Import AE

Import AE is used to respond to requests to verify that the ALATOVIEW is present and active on the network, and to receive CT, MR, and SC images from remote DICOM devices.

2.3 Sequencing of Real World Activities

2.3.1 Features

2.3.1.1 Manual Send of Image, Series or Study

- Operator requests to send images after selecting the images to be transferred from the Study List, the Series List or the Image List.
- When the image transfer fails, The ALATOVIEW automatically attempts to resend the image at a later time.

2.3.1.2 Request of Query/Retrieve

- Operator can obtain search lists using the patient name, patient ID and/or the examination date as the search key.
- Operator requests to transfer images after selecting the transferred images from the Study List, the Series List or the Image List.
- When the image transfer fails, the error message is displayed and it is possible to choose whether to abort the transfer or continue.

2.3.1.3 Archiving of the Received Image to the Local File System

- The ALATOVIEW receives CT and MR images from remote DICOM devices.
- The ALATOVIEW archives the received images to the local file system.

2.3.2 Operation

2.3.2.1 Manual Send of Image, Series or Study

The operation for sending images is described below:

Step-1: Select the images, the series or the studies to be sent.

Step-2: Select the destination of image sending.

Step-3: Request sending.

2.3.2.2 Request of Query/Retrieve

The operation for a search request and an image transfer request are described below:

Step-1: Select the source of image transfer.

Step-2: Enter the information, patient name, patient ID and/or examination date, for the items for which the operator wishes to search.

Step-3: Select the images, the series or the studies to be transfer.

Step-4: Select the destination of image transfer.

Step-5: Request transfer.

2.3.2.3 Archiving of the Received Image to the Local File System

There is no specific operation for receiving and archiving images.

3 AE Specifications

3.1 Export Specification

Export AE provides Standard Conformance to the following DICOM SOP Classes as an SCU:

Table 1

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
Study Root Query/Retrieve Information Model-Find	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model-Move	1.2.840.10008.5.1.4.1.2.2.2

3.1.1 Export Association Establishment Policies

3.1.1.1 Export General

Export AE will utilize and understand the following Application Context Name:

Table 2

DICOM V3.0 Application Context	1.2.840.10008.3.1.1.1

Export AE supports a minimum PDU size of 16Kbytes and a maximum PDU size of 16Kbytes. The default value is set to 16Kbytes.

3.1.1.2 Export Number of Associations

Export AE can only establish one association at a time, independent of the number of destinations chosen.

3.1.1.3 Export Asynchronous Nature

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

3.1.1.4 Export Implementation Identifying Information

Export AE will specify the following Implementation Identifying Information:

- Implementation Class UID 1.2.392.200036.9116.2.2.2.100
- Implementation Version Name TM_CT_CMW_V2.00

3.1.2 Export Association Initiation by Real-World Activity

Export AE initiates an association when the following activity is chosen by the operator:

- "Manual send of image, series or study"
  - Verification- Verify that a remote DICOM device is present on the network
  - Storage - Create and store a CT, MR and SC image to a remote DICOM device

  Verification is initiated automatically at the "Manual send of image or study"
- "Request of Query/Retrieve"
  - Query/Retrieve(Find) - Get an image list from a remote DICOM device
  - Query/Retrieve(Move) - Send an image transfer request to a remote DICOM device

3.1.2.1 Export Real-World Activity - Verification

3.1.2.1.1 Export Associated Real-World Activity - Verification

Export AE performs Verification automatically before performing an image transfer request. This feature can be turned off in the configuration, should the destination device not support the Verification Service.

3.1.2.1.2 Export Proposed Presentation Contexts - Verification

Export AE proposes the following Presentation Contexts shown below:

Table 3

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

3.1.2.2 Export Real-World Activity - Storage

3.1.2.2.1 Export Associated Real-World Activity - Storage

Storage is executed by the ALATOVIEW after the operator's image transfer requests are queued.

3.1.2.2.2 Export Proposed Presentation Contexts - Storage

Export AE proposes the following Presentation Contexts shown below:

Table 4

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.1.2.2.2.1 Export SOP Specific Conformance - Storage

Export AE operation involves the following sequence of steps for each image transfer.

(1) Association establishment (requestor only)

(2) Data transfer (SCU only)

(3) Association release (requestor only)

Export AE judges that the transfer of one image succeeded when the result of (2) “Data transfer” is “Success” even if the result of (3) “Association release” is “Failure”.

3.1.2.3 Export Real-World Activity - Query/Retrieve(Find)

3.1.2.3.1 Export Associated Real-World Activity - Query/Retrieve(Find)

Query/Retrieve(Find) is executed by the ALATOVIEW when the operator requests to see the Study, Series or Image list of a remote DICOM device.

3.1.2.3.2 Export Proposed Presentation Contexts - Query/Retrieve(Find)

Export AE proposes the following Presentation Contexts shown below:

Table 5

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Exten -ded**
Name	**UID**	**Name List**	**UID List**	**Role**	**Negoti -ation**
Study root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study root Q/R Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.1.2.3.2.1 Export SOP Specific Conformance - Query/Retrieve(Find)

Export AE operation involves the following sequence of steps for each search request:

(1) Association establishment (requestor only)

(2) Query Request (SCU only)

(3) Association release (requestor only)

Export AE judges that query request succeeded when the result of (2) “Query Request” is “Success” even if the result of (3) “Association release” is “Failure”.

Search keys for the Query/Retrieve SCU are described in section 10 ‘Search Keys’.

3.1.2.4 Export Real-World Activity - Query/Retrieve(MOVE)

3.1.2.4.1 Export Associated Real-World Activity - Query/Retrieve(Move)

Query/Retrieve(Move) is executed by the ALATOVIEW after the operator's image transfer requests are queued.

3.1.2.4.2 Export Proposed Presentation Contexts - Query/Retrieve(Move)

Export AE proposes the following Presentation Contexts shown below:

Table 6

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Exten -ded**
Name	**UID**	**Name List**	**UID List**	**Role**	**Negoti -ation**
Study root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study root Q/R Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.1.2.4.2.1 Export SOP Specific Conformance - Query/Retrieve(Move)

Export AE operation involves the following sequence of steps for each retrieve request :

(1) Association establishment (requestor only)

(2) Retrieve(image transfer) Request (SCU only)

(3) Association release (requestor only)

Export AE judges that the transfer of one image succeeded when the result of (2) “Retrieve Request” is “Success” even if the result of (3) “Association release” is “Failure”.

3.1.3 Export Association Acceptance Policy

Export AE does not accept any associations generated by remote applications.

3.2 Import Specification

Import AE provides Standard Conformance to the following DICOM SOP Classes as an SCP:

Table 7

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Storage	1.2.840.10008.5.1.4.1.1.4

3.2.1 Import Association Establishment Policies

3.2.1.1 Import General

Import AE will utilize and understand the following Application Context Name:

Table 8

DICOM V3.0 Application Context	1.2.840.10008.3.1.1.1

Import AE supports a minimum PDU size of 16Kbytes and a maximum PDU size of 16Kbytes. The default value is set to 16Kbytes.

3.2.1.2 Import Number of Associations

Import AE supports up to three associations at a time.

3.2.1.3 Import Asynchronous Nature

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

3.2.1.4 Import Implementation Identifying Information

Import AE will specify the following Implementation Identifying Information:

- Implementation Class UID 1.2.392.200036.9116.2.2.2.100
- Implementation Version Name TM_CT_CMW_V2.00

3.2.2 Import Association Initiation by Real-World Activity

Import AE never initiates an association.

3.2.3 Import Association Acceptance Policy

When Import AE receives an association request, it will allow the following activities to be performed during that association:

- Verification - Allow a remote DICOM device to verify that the ALATOVIEW is active on the DICOM network
- Storage - Allow a remote DICOM device to send a CT or MR image to the ALATOVIEW

3.2.3.1 Import Real-World Activity - Verification

3.2.3.1.1 Import Associated Real-World Activity - Verification

The ALATOVIEW responds to Verification made by a remote Verification SCU.

3.2.3.1.2 Import Presentation Context Table - Verification

Import AE accepts all of the Presentation Contexts shown below:

Table 9

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

3.2.3.1.2.1 Import SOP Specific Conformance - Verification

Import AE responds with the following status codes in response to a C-ECHO request.

Table 10

Service Status	Further Meaning	Protocol Codes	Description
Success	Success	0x0000	Operation performed properly

3.2.3.1.3 Import Presentation Context Acceptance Criterion - Verification

Import AE accepts the Presentation Contexts listed in the Presentation Context Table(Table 9).

3.2.3.1.4 Import Transfer Syntax Selection Policies - Verification

Import AE supports only the Implicit VR Little Endian transfer syntax. It rejects any proposed Presentation Context which does not specify the default Implicit VR Little Endian transfer syntax.

3.2.3.2 Import Real-World Activity - Storage

3.2.3.2.1 Import Associated Real-World Activity - Storage

The ALATOVIEW receives image data sent by a remote Storage SCU, archives it to local file system, and responds to the remote Storage SCU.

3.2.3.2.2 Import Presentation Context Table - Storage

Import AE accepts all of the Presentation Contexts shown below:

Table 11

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

3.2.3.2.2.1 Import SOP Specific Conformance - Storage

Import AE responds with the following status codes in response to a C-STORE request.

Import AE is Level 0 Conformance as described in Part 4 of the DICOM V3.0 Standard document.

The subset saved in the ALATOVIEW is described in section 9.

Table 12

Service Status	Further Meaning	Protocol Codes	Description
Success	Success	0x0000	Operation performed properly
Error	Data Set does not match SOP Class	0xA900	SOP Class UID does not match.
	Cannot understand	0xC000	Invalid data set, or not supported extended character sets. (see chapter 7 'Support of Extended Character Sets')
Refused	Out of Resources	0xA700	Local resource is insufficient.

When the service status response is "Refused", check the ALATOVIEW System for one of the following situations:

1) Out of free local storage space
2) Busy processes/applications that are draining CPU resources

3.2.3.2.3 Import Presentation Context Acceptance Criterion - Storage

Import AE accepts the Presentation Contexts listed in the Presentation Context Table(Table 11).

3.2.3.2.4 Import Transfer Syntax Selection Policies - Storage

Import AE accepts the Transfer Syntax listed in the Presentation Context Table(Table 11).

The selection priority of acceptable Transfer Syntax is the Default Transfer Syntax. See 6.4.2.

4 Communication Profiles

4.1 Supported Communication Stacks

This product provides DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.2 OSI Stack

Not applicable to this product.

4.3 TCP/IP Stack

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

4.3.1 API

Not applicable to this product.

4.3.2 Physical Media Support

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

4.4 Point-to-Point Stack

Not applicable to this product.

5 Extensions/Specializations/Privatizations

Not applicable to this product.

6 Configuration

For the ALATOVIEW, the configuration can be set using the DICOM Online Setup interface.

Note: Settings is performed by Toshiba Service Personnel at the time of installation of the ALATOVIEW.

6.1 AE Title/Presentation Address Mapping

The mapping from the AE titles to the presentation addresses are as follows:

- One port number and one AE title can be described for one host name.
- Each AE title is mapped to one port number.
- The ALATOVIEW has following default values:

Local Port No.	2700
Local AE Title	TM_CW_DCM_00

6.2 Configurable Parameters

6.2.1 Time-out Value, Retry Count, Retry Interval

The time-out value, retry count, and retry interval in each status are shown below.

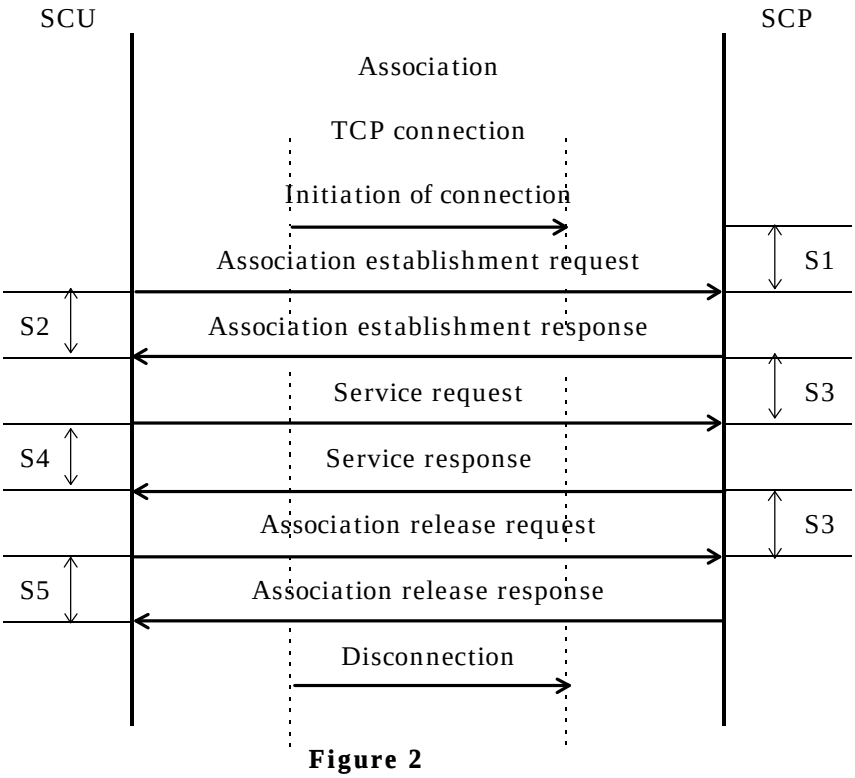

Figure 2

Table 13

Status	Item	Time-out value	Retry count	Retry interval	Remarks
S1	Association establishment request waiting time	default: 30 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set in the ALATOVIEW.
S2	Association establishment response waiting time	default: 30 seconds range: 1 to 999999	default: Once range: 0 to 999999	default: 30 seconds range: 0 to 999999	Only one parameter can be set in the ALATOVIEW.
S3	Service request waiting time	default: 180 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set in the ALATOVIEW.
S4	Service response waiting time	default: 180 seconds range: 1 to 999999	Not set	Not set	Can be set for each provided service
S5	Association release waiting time	default: 5 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set in the ALATOVIEW.

6.2.2 Warning Status Criteria

The warning status criteria can be set for each station and each service, for Export AE.

6.2.2.1 CT Image Storage

If SUCCESS is set, the ALATOVIEW judges that the image transfer succeeded.

If FAIL is set, the ALATOVIEW judges that the image transfer failed.

Table 14

Warning response	Default	Parameter setting range
Coercion of Data Elements	FAIL	SUCCESS or FAIL
Data Set does not match SOP Class	FAIL	SUCCESS or FAIL
Elements discarded	FAIL	SUCCESS or FAIL

6.2.2.2 MR Image Storage

If SUCCESS is set, the ALATOVIEW judges that the image transfer succeeded.

If FAIL is set, the ALATOVIEW judges that the image transfer failed.

Table 15

Warning response	Default	Parameter setting range
Coercion of Data Elements	FAIL	SUCCESS or FAIL
Data Set does not match SOP Class	FAIL	SUCCESS or FAIL
Elements discarded	FAIL	SUCCESS or FAIL

6.2.2.3 SC Image Storage

If SUCCESS is set, the ALATOVIEW judges that the image transfer succeeded.

If FAIL is set, the ALATOVIEW judges that the image transfer failed.

Table 16

Warning response	Default	Parameter setting range
Coercion of Data Elements	FAIL	SUCCESS or FAIL
Data Set does not match SOP Class	FAIL	SUCCESS or FAIL
Elements discarded	FAIL	SUCCESS or FAIL

6.3 Implementation Information and Maximum Reception PDU Size

The default values for the ALATOVIEW are used for the Implementation Class UID, the Implementation Version name, and the Maximum length received. They cannot be changed.

Table 17

Parameter	Default
Implementation Class UID	1.2.392.200036.9116.2.2.2.100
Implementation Version Name	TM_CT_CMW_V2.00
Maximum length received	0x4000(16Kbytes)

6.4 Default Transfer Syntax

6.4.1 Export AE

In CT Image Storage, MR Image Storage and SC Image Storage, when two transfer syntax responses are received, the ALATOVIEW performs the transfer using the following setting:

Default = "Explicit VR Big Endian"

6.4.2 Import AE

The selection priority of acceptable Transfer Syntax is the following Default Transfer Syntax:

Default = "Explicit VR Big Endian"

7 Support of Extended Character Sets

This product supports the following character sets:

- ISO-IR 6 (default) ISO 646
- ISO-IR 100 (Latin Alphabet No.1) Supplementary set of ISO 8859

If Import AE receives image data that contains characters from an unsupported character set, Import AE will respond with “Cannot understand” to the C-STORE request.

If Import AE receives image data that contains characters from ‘ISO-IR 100’, a G1 character may replace any G0 character. The method of replacement is configurable. It can be set using the service tool.

Note: Settings is performed by Toshiba Service Personnel at the time of installation of the ALATOVIEW.

8 Information Object Definition - Storage SCU

8.1 Entity Module Definitions

The information modules for the ALATOVIEW are defined below.

8.1.1 CT IOD Modules

Table 18

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	8.2.1	M
Study	General Study Module	8.2.2	M
	Patient Study Module	8.2.3	U
Series	General Series Module	8.2.4	M
Frame of Reference	Frame of Reference Module	8.2.5	M
Equipment	General Equipment Module	8.2.6	M
Image	General Image Module	8.2.7	M
	Image Plane Module	8.2.8	M
	Image Pixel Module	8.2.9	M
	Contrast/Bolus Module	8.2.10	C
	VOI LUT Module	8.2.11	U
	SOP Common Module	8.2.12	M
	CT Image Module	8.2.13	M

[1] M=Mandatory, C=Conditional, U=User option

8.1.2 MR IOD Modules

Table 19

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	8.2.1	M
Study	General Study Module	8.2.2	M
	Patient Study Module	8.2.3	U
Series	General Series Module	8.2.4	M
Frame of Reference	Frame of Reference Module	8.2.5	M
Equipment	General Equipment Module	8.2.6	M
Image	General Image Module	8.2.7	M
	Image Plane Module	8.2.8	M
	Image Pixel Module	8.2.9	M
	Contrast/Bolus Module	8.2.10	C
	VOI LUT Module	8.2.11	U
	SOP Common Module	8.2.12	M
	MR Image Module	8.2.14	M

[1] M=Mandatory, C=Conditional, U=User option

8.1.3 SC IOD Modules

Table 20

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	8.2.1	M
Study	General Study Module	8.2.2	M
	Patient Study Module	8.2.3	U
Series	General Series Module	8.2.4	M
Equipment	General Equipment Module	8.2.6	U
	SC Equipment Module	8.2.15	M
Image	General Image Module	8.2.7	M
	Image Pixel Module	8.2.9	M
	SC Image Module	8.2.16	M
	VOI LUT Module	8.2.11	U
	SOP Common Module	8.2.12	M

[1] M=Mandatory, U=User option

8.2 Information Object Definitions

8.2.1 Patient Module

Table 21

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Always set
Patient ID	(0010,0020)	2	Always set
Patient's Birth Date	(0010,0030)	2	Length=0 when no entry is made.
Patient's Sex	(0010,0040)	2	Length=0 when no entry is made.
Patient Comments	(0010,4000)	3	Not set when no entry is made

8.2.2 General Study Module

Table 22

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Always set
Study Date	(0008,0020)	2	Always set
Study Time	(0008,0030)	2	Always set
Referring Physician's Name	(0008,0090)	2	Length=0 when no entry is made.
Study ID	(0020,0010)	2	Always set

8.2.3 Patient Study Module

Table 23

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010,1010)	3	Not set when no entry is made

8.2.4 General Series Module

Table 24

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Always set(“CT”,”MR”)
Series Instance UID	(0020,000E)	1	Always set
Series Number	(0020,0011)	2	Always set
Series Date	(0008,0021)	3	Always set
Series Time	(0008,0031)	3	Always set
Operator's Name	(0008,1070)	3	Not set when no entry is made
Patient Position	(0018,5100)	2C	Always set

8.2.5 Frame of Reference Module

Table 25

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Always set
Position Reference Indicator	(0020,1040)	2	Length=0 when no entry is made.

8.2.6 General Equipment Module

Table 26

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Always set(“TOSHIBA”)
Institution Name	(0008,0080)	3	Always set
Station Name	(0008,1010)	3	Always set
Institutional Department Name	(0008,1040)	3	Not set when no entry is made
Manufacturer's Model Name	(0008,1090)	3	Always set
Device Serial Number	(0018,1000)	3	Not set when no entry is made
Software Versions	(0018,1020)	3	Not set when no entry is made

8.2.7 General Image Module

Table 27

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	Always set
Patient Orientation	(0020,0020)	2C	If the setting conditions are met, Length=0 when no entry is made.
Image Date	(0008,0023)	2C	Always set
Image Time	(0008,0033)	2C	Always set
Image Type	(0008,0008)	1	Always set (See 8.2.13)
Acquisition Number	(0020,0012)	3	Always set
Acquisition Date	(0008,0022)	3	Always set
Acquisition Time	(0008,0032)	3	Always set
Image in Acquisition	(0020,1002)	3	Not set when no entry is made
Image Comments	(0020,4000)	3	Not set when no entry is made

8.2.8 Image Plane Module

Table 28

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	Always set
Image Orientation	(0020,0037)	1	Always set
Image Position	(0020,0032)	1	Always set
Slice Thickness	(0018,0050)	2	Always set

8.2.9 Image Pixel Module

Table 29

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Always set[1]
Photometric Interpretation	(0028,0004)	1	Always set[2]
Rows	(0028,0010)	1	Always set[3]
Columns	(0028,0011)	1	Always set[4]
Bits Allocated	(0028,0100)	1	Always set[5]
Bits Stored	(0028,0101)	1	Always set[6]
High Bit	(0028,0102)	1	Always set[7]
Pixel Representation	(0028,0103)	1	Always set
Pixel Data	(7FE0,0010)	1	Always set

[1]CT Image Storage:See 8.2.13, MR Image Storage:See 8.2.14
SC Image Storage:1(when “MONOCHROME2”) or 3(when “RGB”)

[2]CT Image Storage:See 8.2.13, MR Image Storage:See 8.2.14
SC Image Storage:”MONOCHROME2” or “RGB”

[3]CT Image Storage:See 8.2.13

[4]CT Image Storage:See 8.2.13

[5]CT Image Storage:See 8.2.13, MR Image Storage:See 8.2.14
SC Image Storage:16(when “MONOCHROME2”) or 8(when “RGB”)

[6]CT Image Storage:See 8.2.13
SC Image Storage:16(when “MONOCHROME2”) or 8(when “RGB”)

[7]CT Image Storage:See 8.2.13
SC Image Storage:15(when “MONOCHROME2”) or 7(when “RGB”)

8.2.10 Contrast/Bolus Module

This module is set if contrast media was used in the image.

Table 30

Attribute Name	Tag	Type	Attribute Description
Contrast/Bolus Agent	(0018,0010)	2	Always set
Contrast/Bolus Volume	(0018,1041)	3	Not set when no entry is made

8.2.11 VOI LUT Module

Table 31

Attribute Name	Tag	Type	Attribute Description
Window Center	(0028,1050)	3	Always set when CT Image Storage
Window Width	(0028,1051)	1C	Always set when CT Image Storage

8.2.12 SOP Common Module

Table 32

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Always set
SOP Instance UID	(0008,0018)	1	Always set

8.2.13 CT Image Module

Table 33

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Always set ("ORIGINAL¥PRIMARY¥AXIAL", "ORIGINAL¥PRIMARY¥LOCALIZER" or "DERIVED¥SECONDARY")
Samples per Pixel	(0028,0002)	1	Always set (1)
Photometric Interpretation	(0028,0004)	1	Always set ("MONOCHROME2")
Bits Allocated	(0028,0100)	1	Always set (16)
Bits Stored	(0028,0101)	1	Always set (16)
High Bit	(0028,0102)	1	Always set (l5)
Rescale Intercept	(0028,1052)	1	Always set("0")
Rescale Slope	(0028,1053)	1	Always set("1")
KVP	(0018,0060)	2	Always set
Acquisition Number	(0020,0012)	2	Always set
Scan Options	(0018,0022)	3	Always set One of following choices is set for Scan Options: "SCANOSCOPE","NORMAL_CT", "DYNAMIC_CT", "HELICAL_CT"
Reconstruction Diameter	(0018,1100)	3	Always set
Gantry/Detector Tilt	(0018,1120)	3	Always set
Table Height	(0018,1130)	3	Always set
Rotation Direction	(0018,1140)	3	Always set
Exposure Time	(0018,1150)	3	Always set
X-ray Tube Current	(0018,1151)	3	Always set
Exposure	(0018,1152)	3	Always set
Convolution Kernel	(0018,1210)	3	Always set

8.2.14 MR Image Module

Table 34

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Always set ("ORIGINAL¥PRIMARY¥OTHER" or "DERIVED¥SECONDARY")
Samples per Pixel	(0028,0002)	1	Always set (1)
Photometric Interpretation	(0028,0004)	1	Always set ("MONOCHROME2")
Bits Allocated	(0028,0100)	1	Always set (16)
Scanning Sequence	(0018,0020)	1	Always set
Sequence Variant	(0018,0021)	1	Always set ("NONE")
Scan Options	(0018,0022)	2	Length=0 when no entry is made.
MR Acquisition Type	(0018,0023)	2	Length=0 when no entry is made.
Repetition Time	(0018,0080)	2C	If the setting conditions are met, Length=0 when no entry is made.
Echo Time	(0018,0081)	2	Length=0 when no entry is made.
Echo Train Length	(0018,0091)	2	Length=0 when no entry is made.
Inversion Time	(0018,0082)	2C	If the setting conditions are met, Length=0 when no entry is made.
Trigger Time	(0018,1060)	2C	If the setting conditions are met, Length=0 when no entry is made.
Reconstruction Diameter	(0018,1100)	3	Not set when no entry is made

8.2.15 SC Equipment Module

Table 35

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	Always set ("WSD")
Modality	(0008,0060)	3	Always set("CT")
Secondary Capture Device ID	(0018,1010)	3	Not set when no entry is made
Secondary Capture Device Manufacturer	(0018,1016)	3	Not set when no entry is made
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Not set when no entry is made
Secondary Capture Device Software Version	(0018,1019)	3	Not set when no entry is made

8.2.16 SC Image Module

Table 36

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018,1012)	3	Not set when no entry is made
Time of Secondary Capture	(0018,1014)	3	Not set when no entry is made

9 Information Object Definition - Storage SCP

The acceptable information objects are the same as those defined in Part 3 of DICOM V3.0 Standard Dodument.

9.1 Entity Module Definitions

The information modules for the ALATOVIEW System are defined below.

9.1.1 CT IOD Modules

Table 37

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	9.2.1	M
Study	General Study Module	9.2.2	M
	Patient Study Module	9.2.3	U
Series	General Series Module	9.2.4	M
Frame of Reference	Frame of Reference Module	9.2.5	M
Equipment	General Equipment Module	9.2.6	M
Image	General Image Module	9.2.7	M
	Image Plane Module	9.2.8	M
	Image Pixel Module	9.2.9	M
	Contrast/bolus Module	9.2.10	C
	VOI LUT Module	9.2.11	U
	SOP Common Module	9.2.12	M
	CT Image Module	9.2.13	M

[1] M=Mandatory, C=Conditional, U=User option

9.1.2 MR IOD Modules

Table 38

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	9.2.1	M
Study	General Study Module	9.2.2	M
	Patient Study Module	9.2.3	U
Series	General Series Module	9.2.4	M
Frame of Reference	Frame of Reference Module	9.2.5	M
Equipment	General Equipment Module	9.2.6	M
Image	General Image Module	9.2.7	M
	Image Plane Module	9.2.8	M
	Image Pixel Module	9.2.9	M
	Contrast/bolus Module	9.2.10	C
	VOI LUT Module	9.2.11	U
	SOP Common Module	9.2.12	M
	MR Image Module	9.2.14	M

[1] M=Mandatory, C=Conditional, U=User option

9.2 Information Object Definitions

9.2.1 Patient Module

Table 39

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	2	
Patient's Birth Date	(0010,0030)	2	
Patient's Sex	(0010,0040)	2	
Other Patient IDs	(0010,1000)	3	
Other Patient Names	(0010,1001)	3	
Patient Comment	(0010,4000)	3	

9.2.2 General Study Module

Table 40

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	
Study Date	(0008,0020)	2	
Study Time	(0008,0030)	2	
Referring Physician's Name	(0008,0090)	2	
Study ID	(0020,0010)	2	
Accession Number	(0008,0050)	2	
Study Description	(0008,1030)	3	
Name of Physician(s) Reading Study	(0008,1060)	3	

9.2.3 Patient Study Module

Table 41

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	
Patient's Age	(0010,1010)	3	
Patient's size	(0010,1020)	3	
Patient's weight	(0010,1030)	3	

9.2.4 General Series Module

Table 42

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	2	
Laterality	(0020,0060)	2C	
Series Date	(0008,0021)	3	
Series Time	(0008,0031)	3	
Performing Physicians' Name	(0008,1050)	3	
Protocol Name	(0008,1030)	3	
Body Part Examined	(0018,0015)	3	
Patient Position	(0018,5100)	2C	

9.2.5 Frame of Reference Module

Table 43

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	
Position Reference Indicator	(0020,1040)	2	

9.2.6 General Equipment Module

Table 44

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	
Institution Name	(0008,0080)	3	
Station Name	(0008,1010)	3	
Institutional Department Name	(0008,1040)	3	
Manufacturer's Model Name	(0008,1090)	3	
Device Serial Number	(0018,1000)	3	
Software Versions	(0018,1020)	3	
Spatial Resolution	(0018,1050)	3	
Date of Last Calibration	(0018,1200)	3	
Time of Last Calibration	(0018,1201)	3	

9.2.7 General Image Module

Table 45

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	
Patient Orientation	(0020,0020)	2C	
Image Date	(0008,0023)	2C	
Image Time	(0008,0033)	2C	
Image Type	(0008,0008)	1	
Acquisition Number	(0020,0012)	3	
Acquisition Date	(0008,0022)	3	
Acquisition Time	(0008,0032)	3	
Image in Acquisition	(0020,1002)	3	
Image Comments	(0020,4000)	3	

9.2.8 Image Plane Module

Table 46

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	
Image Orientation	(0020,0037)	1	
Image Position	(0020,0032)	1	
Slice Thickness	(0018,0050)	2	
Slice Location	(0020,1041)	3	

9.2.9 Image Pixel Module

Table 47

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	
Photometric Interpretation	(0028,0004)	1	
Rows	(0028,0010)	1	
Columns	(0028,0011)	1	
Bits Allocated	(0028,0100)	1	
Bits Stored	(0028,0101)	1	
High Bit	(0028,0102)	1	
Pixel Representation	(0028,0103)	1	
Pixel Data	(7FE0,0010)	1	
Pixel Aspect Ratio	(0028,0034)	1C	
Smallest Image Pixel Value	(0028,0106)	3	
Largest Image Pixel Value	(0028,0107)	3	

9.2.10 Contrast/Bolus Module

This module is set if contrast media was used in the image.

Table 48

Attribute Name	Tag	Type	Attribute Description
Contrast/Bolus Agent	(0018,0010)	2	
Contrast/Bolus Route	(0018,1040)	3	
Contrast/Bolus Volume	(0018,1041)	3	
Contrast/Bolus Start Time	(0018,1042)	3	
Contrast/Bolus Stop Time	(0018,1043)	3	
Contrast/Bolus Total Dose	(0018,1044)	3	

9.2.11 VOI LUT Module

Table 49

Attribute Name	Tag	Type	Attribute Description
Window Center	(0028,1050)	3	
Window Width	(0028,1051)	1C	

9.2.12 SOP Common Module

Table 50

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	
SOP Instance UID	(0008,0018)	1	

9.2.13 CT Image Module

Table 51

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	
Samples per Pixel	(0028,0002)	1	
Photometric Interpretation	(0028,0004)	1	
Bits Allocated	(0028,0100)	1	
Bits Stored	(0028,0101)	1	
High Bit	(0028,0102)	1	
Rescale Intercept	(0028,1052)	1	
Rescale Slope	(0028,1053)	1	
KVP	(0018,0060)	2	
Acquisition Number	(0020,0012)	2	
Scan Options	(0018,0022)	3	
Data Collection Diameter	(0018,0090)	3	
Reconstruction Diameter	(0018,1100)	3	
Distance Source to Detector	(0018,1110)	3	
Distance Source to Patient	(0018,1111)	3	
Gantry/Detector Tilt	(0018,1120)	3	
Table Height	(0018,1130)	3	
Rotation Direction	(0018,1140)	3	
Exposure Time	(0018,1150)	3	
X-ray Tube Current	(0018,1151)	3	
Exposure	(0018,1152)	3	
Filter Type	(0018,1160)	3	
Generator Power	(0018,1170)	3	
Focal Spot	(0018,1190)	3	
Convolution Kernel	(0018,1210)	3	

9.2.14 MR Image Module

Table 52

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	
Samples per Pixel	(0028,0002)	1	
Photometric Interpretation	(0028,0004)	1	
Bits Allocated	(0028,0100)	1	
Scanning Sequence	(0018,0020)	1	
Sequence Variant	(0018,0021)	1	
Scan Options	(0018,0022)	2	
MR Acquisition Type	(0018,0023)	2	
Repetition Time	(0018,0080)	2C	
Echo Time	(0018,0081)	2	
Echo Train Length	(0018,0091)	2	
Inversion Time	(0018,0082)	2C	
Trigger Time	(0018,1060)	2C	
Sequence Name	(0018,0024)	2C	
Echo Number	(0018,0086)	3	
Reconstruction Diameter	(0018,1100)	3	

9.3 Recommendation for Remote Storage SCU

The ALATOVIEW Recommend that following tags have non-zero length data.

Table 53

Attribute Name	Module	Tag	Type	Reasons
Patient's Name	Patient	(0010,0010)	2	To display study list
Patient ID	Patient	(0010,0020)	2	To display study list
Patient Position	General Series	(0018,5100)	2C	To perform three-dimensional image processing
Series Number	General Series	(0020,0011)	2	To perform three-dimensional image processing
Acquisition Number	General Image	(0020,0012)	3	To perform three-dimensional image processing
Image Number	General Image	(0020,0013)	2	To perform three-dimensional image processing
Gantry/Detector Tilt	CT Image	(0018,1120)	3	To perform three-dimensional image processing

10 Search Keys

10.1 Query/Retrieve SCU (C-FIND)

The search keys used for the Query/Retrieve SCP(C-FIND) are shown.

10.1.1 Study Root Information Model-FIND

10.1.1.1 Study Level

Table 54

Attribute Name	Tag	Type
Study Date	(0008,0020)	R
Study Time	(0008,0030)	R
Accession Number	(0008,0050)	R
Study Description	(0008,1030)	O
Patient's Name	(0010,0010)	R
Patient ID	(0010,0020)	R
Patient's Sex	(0010,0040)	O
Patient's Age	(0010,1010)	O
Study Instance UID	(0020,000D)	U
Study ID	(0020,0010)	R
Number of Study Related Series	(0020,1206)	O
Number of Study Related Images	(0020,1208)	O

10.1.1.2 Series Level

Table 55

Attribute Name	Tag	Type
Modality	(0008,0060)	R
Series Instance UID	(0020,000e)	U
Series Number	(0020,0011)	R

10.1.1.3 Image Level

Table 56

Attribute Name	Tag	Type
SOP Instance UID	(0008,0018)	U
Acquisition Date	(0008,0022)	O
Contrast/Bolus Agent	(0018,0010)	O
Scanning Sequence	(0018,0020)	O
Slice Thickness	(0018,0050)	O
KVP	(0018,0060)	O
Repetition Time	(0018,0080)	O
Echo Time	(0018,0081)	O
Inversion Time	(0018,0082)	O
Echo Number(s)	(0018,0086)	O
Gantry/Detector Tilt	(0018,1120)	O
X-ray Tube Current	(0018,1151)	O
Convolution Kernel	(0018,1210)	O
Acquisition Number	(0020,0012)	O
Image Number	(0020,0013)	R
Rows	(0028,0010)	O

11 Restriction

- The ALATOVIEW can handle only 256 * 256 images or 512 * 512 images in processing modes other than 2-dimensional image display mode.
- The ALATOVIEW can handle pixel values only in the range from -2048 to 2047. A pixel value lower than -2048 or higher than 2047 is automatically set to -2048 or 2047, respectively.