TOSHIBA

No. MIIUS0001EA

DICOM
CONFORMANCE STATEMENT
FOR
ULTRASOUND WORKSTATION
MODEL UIWS-300A
(STORAGE/PRINT)

TOSHIBA CORPORATION

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1 Introduction

This document is a DICOM Conformance Statement for Toshiba's Ultrasound Workstation(UIWS-300A). 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

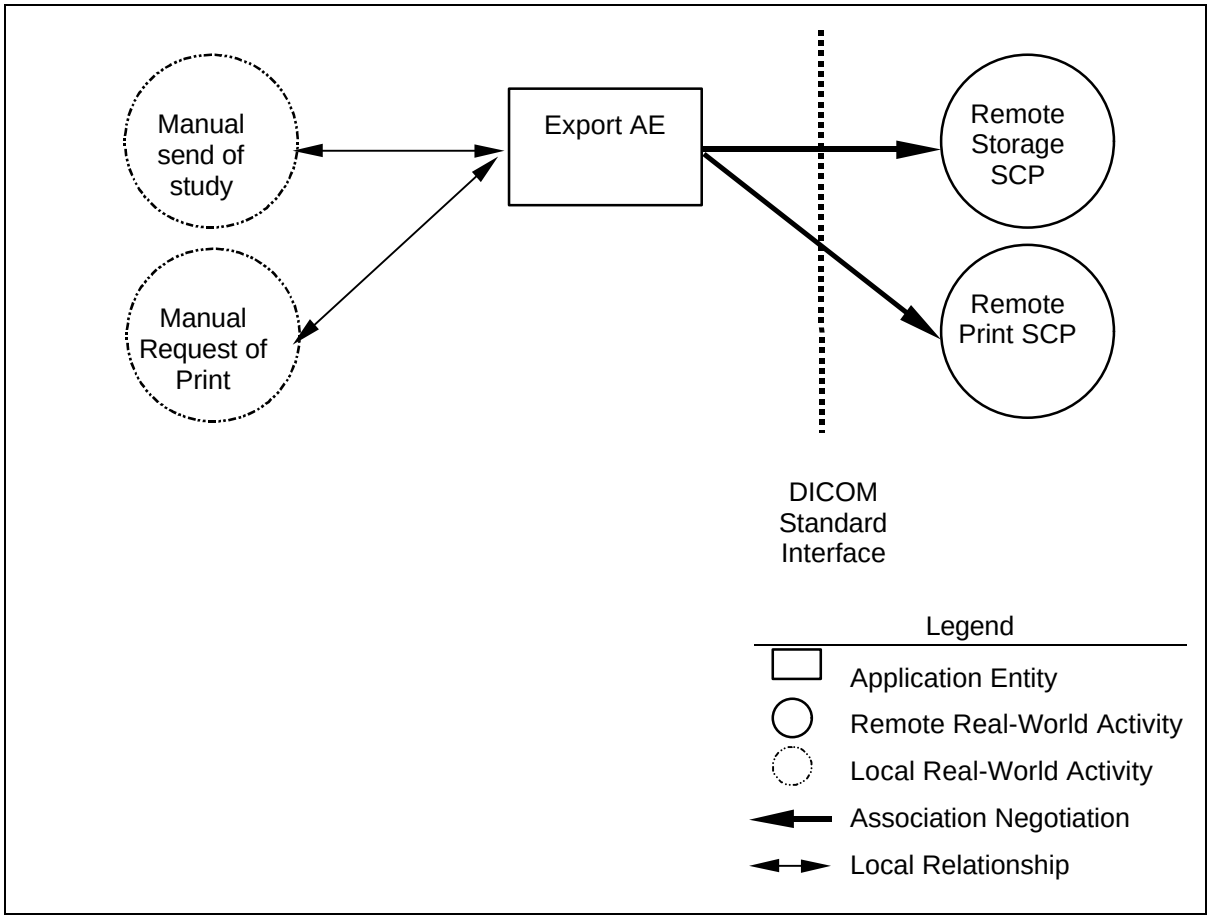

Figure 1

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, and to transmit images to a remote DICOM device. It therefore performs the following tasks:

- Builds DICOM SC, US, US Multi-frame Image Information Objects
- Establishes DICOM Association with remote DICOM device
- Performs Storage of DICOM SC, US, US Multi-frame Information Objects to remote DICOM device
- Performs Verification of remote DICOM device's presence on network

Export AE is used to transmit request for Print images to a remote DICOM device. It therefore performs the following tasks:

- Builds DICOM Basic Grayscale, Color Print Objects
- Establishes DICOM Association with remote DICOM device
- Performs transmit of DICOM Basic Grayscale, Color Print Objects to remote DICOM device

2.3 Sequencing of Real World Activities

2.3.1 Features

2.3.1.1 Manual send of study

- Operator requests to send a image which is displaying on the screen.
- Operator requests to send images after selecting the transferred studies from the Study List.
- When the study or image transfer fails, operator can manually attempt to resend the study or image at a later time.

2.3.1.2 Manual request of Print

- The number of frames in the rows and columns on each film can be specified as desired.
- If an error occurs during printing, the selection retry or delete printing is required.
- Print requests are placed on a queue, and are executed in the background.

2.3.2 Operation

2.3.2.1 Manual send of study

The operations for manual image transferring are described below :

Opreration-1

Step-1: Display the image to be transferred.

Step-2: Request transfer.

Operation-2

Step-1: Select the study to be transferred.

Step-2: Request transfer.

2.3.2.2 Manual request of Print

The operation for printing is described below:

Step-1: Enter the information for the film, and select each of the images to be printed.

Step-2: Execute the print request.

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
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9
Basic Color Print Management	1.2.840.10008.5.1.1.18

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 128Kbyte and a maximum PDU size of 128Kbytes. The default value is set to 128Kbytes.

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:

Table 3

System	Implementation Class UID	Implementation Version Name
UIWS-300A	1.2.392.200036.9116.6.7.1	TM_US_WS_1.0

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 study"
  - — Verification- Verify that a remote DICOM device is present on the network
  - — Storage - Create and store a SC, US, US Multi-frame image to a remote DICOM device

Verification is initiated automatically at the "Manual send of study".

- "Manual Request of Print"
  - — Print - Request print image 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 a study transfer request.

3.1.2.1.2 Export Proposed Presentation Contexts - Verification

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**		
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 Ultrasound Workstation after the operator's study transfer are requested.

3.1.2.2.2 Export Proposed Presentation Contexts - Storage

Export AE proposes the following Presentation Contexts shown below:

Table 5

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEG Lossy, Baseline Sequential with Huffman Coding (Process1)	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	RLE Lossless Image Compression	1.2.840.10008.1.2.5	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossy, Baseline Sequential with Huffman Coding (Process1)	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	RLE Lossless Image Compression	1.2.840.10008.1.2.5	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossy, Baseline Sequential with Huffman Coding (Process1)	1.2.840.10008.1.2.4.50	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 - Print

3.1.2.3.1 Export Associated Real-World Activity - Print

Export AE performs DICOM printing to a destination device. If a communication or printing error occurs, the selection retry or delete printing is required.

3.1.2.3.2 Export Proposed Presentation Contexts - Print

Export AE proposes the following Presentation Contexts shown below:

Table 6

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List**	**UID List**		
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.2.3.2.1 Export SOP Specific Conformance - Print Management

- Export AE operation involves the following sequence of steps for each request print image.

  (1) Association establishment (requestor only)

  (2) Print request (SCU only)

  (3) Association release (requestor only)

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

- DIMSE-Service and Attributes are described in chapter 11.

3.1.3 Export Association Acceptance Policy

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

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 Ultrasound Workstation, the configuration can be set using the Online Setup interface.

Note: Settings and changes are performed by Toshiba Service Personnel at the time of installation of the system.

6.1 AE Title/Presentation Address Mapping

Mapping from the AE titles to the presentation addresses is 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.

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.

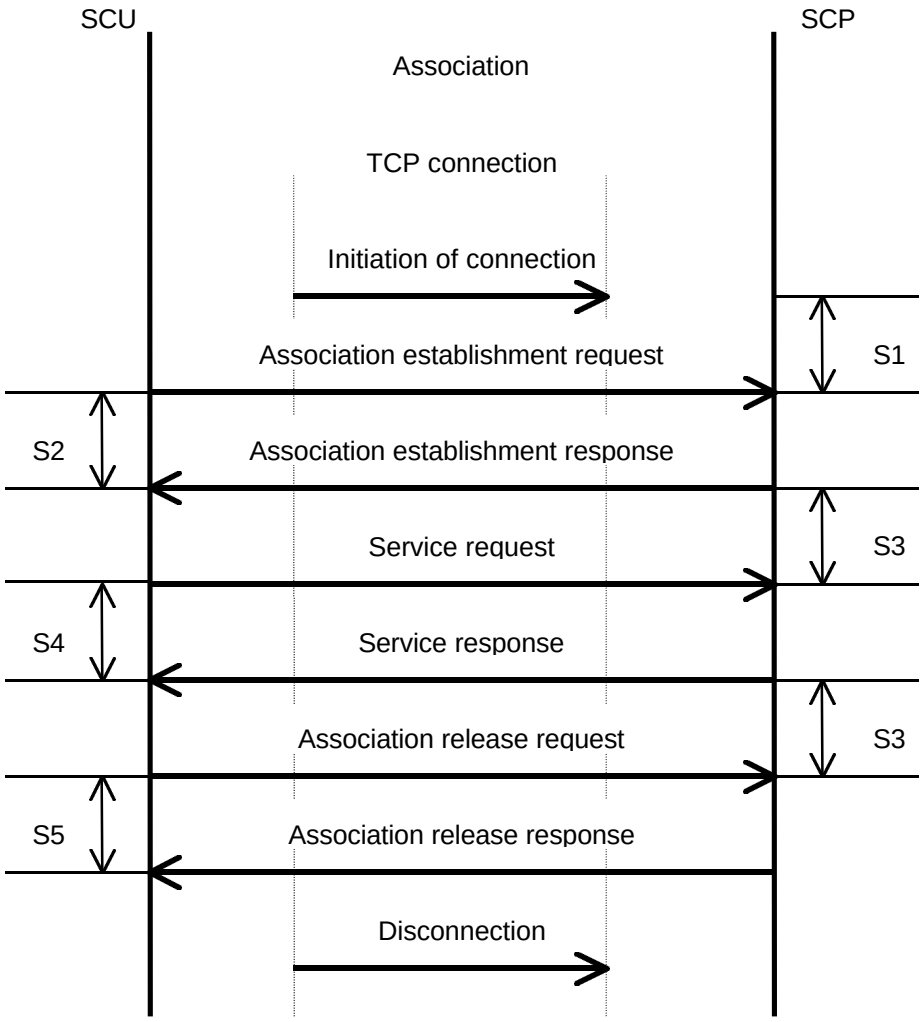

Figure 2

Table 7

Status	Item	Time-out value	Retry count	Retry interval	Remarks
S1	Association establishment request waiting time	Not set	Not set	Not set	Not applicable to this product.
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.
S3	Service request waiting time	Not set	Not set	Not set	Not applicable to this product.
S4	Service response waiting time	default: 180 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set.
S5	Association release waiting time	default: 5 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set.

6.2.2 Warning Status Criteria

6.2.2.1 Secondary Capture Image Storage

6.2.2.1.1 C-STORE response

If SUCCESS is set, this product judges that C-STORE request succeeded.

If FAIL is set, this product judges that C-STORE request failed.

Table 8

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 Ultrasound Image Storage

6.2.2.2.1 C-STORE response

If SUCCESS is set, this product judges that C-STORE request succeeded.

If FAIL is set, this product judges that C-STORE request failed.

Table 9

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 Ultrasound Multi-frame Image Storage

6.2.2.3.1 C-STORE response

If SUCCESS is set, this product judges that C-STORE request succeeded.

If FAIL is set, this product judges that C-STORE request failed.

Table 10

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

6.2.2.4 Basic Grayscale Print Management

6.2.2.4.1 Basic Film Session SOP Class

6.2.2.4.1.1 N-CREATE response

If SUCCESS is set, this product judges that N-CREATE request succeeded.

If FAIL is set, this product judges that N-CREATE request failed.

Table 11

Warning response	Default	Parameter setting range
Memory allocation not supported	FAIL	SUCCESS or FAIL

6.2.2.4.2 Basic Film Box SOP Class

6.2.2.4.2.1 N-ACTION response

If SUCCESS is set, this product judges that N-ACTION request succeeded.

If FAIL is set, this product judges that N-ACTION request failed.

Table 12

Warning response	Default	Parameter setting range
Film Box SOP Instance hierarchy does not contain Image Box SOP Instances(empty page)	FAIL	SUCCESS or FAIL

6.2.2.4.3 Printer SOP Class

6.2.2.4.3.1 N-GET response

If SUCCESS is set, this product judges that N-GET request succeeded.

If FAIL is set, this product judges that N-GET request failed.

Table 13

Warning response	Default	Parameter setting range
Attribute list error	FAIL	SUCCESS or FAIL

6.2.2.5 Basic Color Print Management

6.2.2.5.1 Basic Film Session SOP Class

6.2.2.5.1.1 N-CREATE response

If SUCCESS is set, this product judges that N-CREATE request succeeded.

If FAIL is set, this product judges that N-CREATE request failed.

Table 14

Warning response	Default	Parameter setting range
Memory allocation not supported	FAIL	SUCCESS or FAIL

6.2.2.5.2 Basic Film Box SOP Class

6.2.2.5.2.1 N-ACTION response

If SUCCESS is set, this product judges that N-ACTION request succeeded.

If FAIL is set, this product judges that N-ACTION request failed.

Table 15

Warning response	Default	Parameter setting range
Film Box SOP Instance hierarchy does not contain Image Box SOP Instances(empty page)	FAIL	SUCCESS or FAIL

6.2.2.5.3 Printer SOP Class

6.2.2.5.3.1 N-GET response

If SUCCESS is set, this product judges that N-GET request succeeded.

If FAIL is set, this product judges that N-GET request failed.

Table 16

Warning response	Default	Parameter setting range
Attribute list error	FAIL	SUCCESS or FAIL

6.3 Implementation Information and Maximum Reception PDU Size

The default values for the Ultrasound Workstation are used for the Implementation Class UID, the Implementation Version name, and the Maximum length received.

Table 17

Parameter	Default
Implementation Class UID	1.2.392.200036.9116.6.7.1
Implementation Version Name	TM_US_WS_1.0
Maximum length received (unit:Kbyte)	128Kbytes

7 Support of Extended Character Sets

This product supports the following character sets:

- ISO-IR 100 (Latin alphabet No.1) Supplementary set of ISO 8859

8 Secondary Capture Information Object Definition

8.1 Entity Module Definitions

The information modules for the Ultrasound Workstation are defined below.

8.1.1 Secondary Capture IOD Modules

Table 18

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	0	M
Study	General Study Module	0	M
Study	Patient Study Module	0	U
Series	General Series Module	0	M
Equipment	General Equipment Module	0	U
Equipment	SC Equipment Module	0	M
Image	General Image Module	0	M
Image	Image Pixel Module	0	M
Image	SC Image Module	0	M
Image	Overlay Plane Module	Not Used	U
Image	Modality LUT Module	Not Used	U
Image	VOI LUT Module	Not Used	U
Image	SOP Common Module	0	M

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

8.2 Information Object Definitions

8.2.1 Patient Module

Table 19

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 20

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	Always set
Study ID	(0020, 0010)	2	Always set
Accession Number	(0008, 0050)	2	Always set
Name of Physician(s) Reading Study	(0008,1060)	3	Always set

8.2.3 Patient Study Module

Table 21

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010, 1010)	3	Not set when no entry is made
Patient's Size	(0010,1020)	3	Not set when no entry is made
Patient's Weight	(0010,1030)	3	Not set when no entry is made

8.2.4 General Series Module

Table 22

Attribute Name	Tag	Type	Attribute Description
Modality	(0008, 0060)	1	Always set (“US” or “OT”)
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
Protocol Name	(0018,1030)	3	Always set
Operator’s Name	(0008,1070)	3	Always set

8.2.5 General Equipment Module

Table 23

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008, 0070)	2	Always set (“TOSHIBA_MEC”)
Institution Name	(0008, 0080)	3	Always set
Station Name	(0008,1010)	3	Always set
Manufacturer’s Model Name	(0008,1090)	3	Always set
Device Serial Number	(0018,1000)	3	Always set
Software Version	(0018,1020)	3	Always set

8.2.6 SC Equipment Module

Table 24

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008, 0064)	1	Always set (“WSC”)
Modality	(0008, 0060)	3	Always set (“US” or “OT”)

8.2.7 General Image Module

Table 25

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020, 0013)	2	Always set
Patient Orientation	(0020, 0020)	2C	Always set (Length=0)
Image Date	(0008, 0023)	2C	Always set (Length=0)
Image Time	(0008, 0033)	2C	Always set (Length=0)
Image Type	(0008, 0008)	3	Always set
Acquisition Number	(0020, 0012)	3	Always set
Acquisition Date	(0008, 0022)	3	Always set
Acquisition Time	(0008, 0032)	3	Always set
Lossy Image Compression	(0028, 2110)	3	Always set (0 or 1)

8.2.8 Image Pixel Module

Table 26

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028, 0002)	1	Always set (3)
Photometric Interpretation	(0028, 0004)	1	Always set (“RGB”)
Rows	(0028, 0010)	1	Always set
Columns	(0028, 0011)	1	Always set
Bits Allocated	(0028, 0100)	1	Always set (8)
Bits Stored	(0028, 0101)	1	Always set (8)
High Bit	(0028, 0102)	1	Always set (7)
Pixel Representation	(0028, 0103)	1	Always set (0 or 1)
Pixel Data	(7FE0, 0010)	1	Always set
Planar Configuration	(0028, 0006)	1C	Always set (0)
Pixel Aspect Ratio	(0028, 0034)	1C	Not set

8.2.9 SC Image Module

Table 27

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018, 1012)	3	Not set
Time of Secondary Capture	(0018, 1014)	3	Not set

8.2.10 SOP Common Module

Table 28

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008, 0016)	1	Always set
SOP Instance UID	(0008, 0018)	1	Always set
Specific Character Set	(0008, 0005)	1C	Always set (“ISO_IR 100”)

9 Ultrasound Image Information Object Definition

9.1 Entity Module Definitions

The information modules for the Ultrasound Workstation are defined below.

9.1.1 Ultrasound Image IOD Modules

Table 29

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	9.2.1	M
Study	General Study Module	9.2.2	M
Study	Patient Study Module	9.2.3	U
Series	General Series Module	9.2.4	M
Frame of Reference	Frame of Reference Module	Not Used	U
Frame of Reference	US Frame of Reference Module	Not Used	C
Equipment	General Equipment Module	9.2.5	M
Image[2]	General Image Module	9.2.6	M
Image	Image Pixel Module	9.2.7	M
Image	Palette Color Lookup Table	Not Used	C
Image	Contrast / bolus Module	9.2.8	C
Image	US Region Calibration Module	Not Used	U
Image	US Image Module	9.2.9	M
Image	Overlay Plane Module	Not Used	U
Image	VOI LUT Module	Not Used	U
Image	SOP Common Module	9.2.10	M
Curve[2]	Curve Identification Module	Not Used	M
Curve	Curve Module	Not Used	M
Curve	Audio Module	Not Used	U
Curve	SOP Common	Not Used	M

[1] M=Mandatory, C=Conditional, U=User option
[2] The Image and Curve IEs are mutually exclusive

9.2 Information Object Definitions

9.2.1 Patient Module

Table 30

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

9.2.2 General Study Module

Table 31

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	Always set
Study ID	(0020, 0010)	2	Always set
Accession Number	(0008, 0050)	2	Always set
Name of Physician(s) Reading Study	(0008,1060)	3	Always set

9.2.3 Patient Study Module

Table 32

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010, 1010)	3	Not set when no entry is made
Patient's Size	(0010,1020)	3	Not set when no entry is made
Patient's Weight	(0010,1030)	3	Not set when no entry is made

9.2.4 General Series Module

Table 33

Attribute Name	Tag	Type	Attribute Description
Modality	(0008, 0060)	1	Always set (“US”)
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
Protocol Name	(0018,1030)	3	Always set
Operator’s Name	(0008,1070)	3	Always set

9.2.5 General Equipment Module

Table 34

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008, 0070)	2	Always set
Institution Name	(0008, 0080)	3	Always set
Station Name	(0008,1010)	3	Always set
Manufacturer’s Model Name	(0008,1090)	3	Always set
Device Serial Number	(0018,1000)	3	Always set
Software Version	(0018,1020)	3	Always set

9.2.6 General Image Module

Table 35

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020, 0013)	2	Always set
Patient Orientation	(0020,0020)	2C	Always set (Length=0)
Image Date	(0008, 0023)	2C	Always set
Image Time	(0008, 0033)	2C	Always set
Image Type	(0008,0008)	3	Always set
Acquisition Number	(0020,0012)	3	Always set
Acquisition Date	(0008,0022)	3	Always set
Acquisition Time	(0008,0032)	3	Always set
Lossy Image Compression	(0028,2110)	3	Always set (0 or 1)

9.2.7 Image Pixel Module

Table 36

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028, 0002)	1	Always set (3)
Photometric Interpretation	(0028, 0004)	1	Always set (“RGB”)
Rows	(0028, 0010)	1	Always set
Columns	(0028, 0011)	1	Always set
Bits Allocated	(0028, 0100)	1	Always set (8)
Bits Stored	(0028, 0101)	1	Always set (8)
High Bit	(0028, 0102)	1	Always set (7)
Pixel Representation	(0028, 0103)	1	Always set (0)
Pixel Data	(7FE0, 0010)	1	Always set
Planar Configuration	(0028, 0006)	1C	Always set (0)
Pixel Aspect Ratio	(0028, 0034)	1C	Not set

9.2.8 Contrast / bolus Module

Table 37

Attribute Name	Tag	Type	Attribute Description
Contrast / Bolus Agent	(0018, 0010)	2	Always set

9.2.9 US Image Module

Table 38

Attribute Name	Tag	Type	Attribute Description
Sample Per Pixel	(0028, 0002)	1	Always set (3)
Photometric Interpretation	(0028, 0004)	1	Always set (“RGB”)
Bits Allocated	(0028,0100)	1	Always set (8)
Bits Stored	(0028, 0101)	1	Always set (8)
High Bit	(0028, 0102)	1	Always set (8)
Planar Configuration	(0028, 0006)	1	Always set (0)
Pixel Representation	(0028, 0103)	1	Always set (0)
Image Type	(0008, 0008)	2	Always set
Lossy Image Compression	(0028, 2110)	1C	Always set (0 or 1)
Ultrasound Color Data Present	(0028, 0014)	3	Always set (1)
Heart Rate	(0018, 1088)	3	Always set

9.2.10 SOP Common Module

Table 39

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008, 0016)	1	Always set
SOP Instance UID	(0008, 0018)	1	Always set
Specific Character Set	(0008, 0005)	1C	Always set (“ISO_IR 100”)

10 Ultrasound Multi-frame Image Information Object Definition

10.1 Entity Module Definitions

The information modules for the Ultrasound Workstation are defined below.

10.1.1 Ultrasound Multi-frame Image IOD Modules

Table 40

Information Entity	Module	Reference	Usage[1]
Patient	Patient Module	10.2.1	M
Study	General Study Module	10.2.2	M
Study	Patient Study Module	10.2.3	U
Series	General Series Module	10.2.4	M
Frame of Reference	Frame of Reference Module	Not Used	U
Frame of Reference	US Frame of Reference Module	Not Used	C
Equipment	General Equipment Module	10.2.5	M
Image[2]	General Image Module	10.2.6	M
Image	Image Pixel Module	10.2.7	M
Image	Palette Color Lookup Table Module	Not Used	C
Image	Contrast / bolus Module	10.2.8	C
Image	Cine Module	10.2.9	M
Image	Multi-frame Module	10.2.10	M
Image	US Region Calibration Module	Not Used	U
Image	US Image Module	10.2.11	M
Image	VOI LUT Module	Not Used	U
Image	SOP Common Module	10.2.12	M
Curve[2]	Curve Identification Module	Not Used	M
Curve	Curve Module	Not Used	M
Curve	Audio Module	Not Used	U
Curve	SOP Common	Not Used	M

[1] M=Mandatory, C=Conditional, U=User option
[2] The Image and Curve IEs are mutually exclusive

10.2 Information Object Definitions

10.2.1 Patient Module

Table 41

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

10.2.2 General Study Module

Table 42

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	Always set
Study ID	(0020, 0010)	2	Always set
Accession Number	(0008, 0050)	2	Always set
Name of Physician(s) Reading Study	(0008,1060)	3	Always set

10.2.3 Patient Study Module

Table 43

Attribute Name	Tag	Type	Attribute Description
Patient's Age	(0010, 1010)	3	Not set when no entry is made
Patient's Size	(0010,1020)	3	Not set when no entry is made
Patient's Weight	(0010,1030)	3	Not set when no entry is made

10.2.4 General Series Module

Table 44

Attribute Name	Tag	Type	Attribute Description
Modality	(0008, 0060)	1	Always set (“US”)
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
Protocol Name	(0018,1030)	3	Always set
Operator’s Name	(0008,1070)	3	Always set

10.2.5 General Equipment Module

Table 45

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008, 0070)	2	Always set
Institution Name	(0008, 0080)	3	Always set
Station Name	(0008,1010)	3	Always set
Manufacturer’s Model Name	(0008,1090)	3	Always set
Device Serial Number	(0018,1000)	3	Always set
Software Version	(0018,1020)	3	Always set

10.2.6 General Image Module

Table 46

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020, 0013)	2	Always set
Patient Orientation	(0020,0020)	2C	Always set (Length=0)
Image Date	(0008, 0023)	2C	Always set
Image Time	(0008, 0033)	2C	Always set
Image Type	(0008,0008)	3	Always set
Acquisition Number	(0020,0012)	3	Always set
Acquisition Date	(0008,0022)	3	Always set
Acquisition Time	(0008,0032)	3	Always set
Lossy Image Compression	(0028,2110)	3	Always set (0 or 1)

10.2.7 Image Pixel Module

Table 47

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028, 0002)	1	Always set (3)
Photometric Interpretation	(0028, 0004)	1	Always set (“RGB”)
Rows	(0028, 0010)	1	Always set
Columns	(0028, 0011)	1	Always set
Bits Allocated	(0028, 0100)	1	Always set (8)
Bits Stored	(0028, 0101)	1	Always set (8)
High Bit	(0028, 0102)	1	Always set (7)
Pixel Representation	(0028, 0103)	1	Always set (0)
Pixel Data	(7FE0, 0010)	1	Always set
Planar Configuration	(0028, 0006)	1C	Always set (0)
Pixel Aspect Ratio	(0028, 0034)	1C	Not set

10.2.8 Contrast / bolus Module

Table 48

Attribute Name	Tag	Type	Attribute Description
Contrast / Bolus Agent	(0018, 0010)	2	Always set

10.2.9 Cine Module

Table 49

Attribute Name	Tag	Type	Attribute Description
Frame Time	(0018, 1063)	1C	Always set
Frame Time Vector	(0018, 1065)	1C	Always set
Start Trim	(0018, 2142)	3	Always set (0)
Stop Trim	(0018, 2143)	3	Always set
Recommended Display Frame Rate	(0018, 2144)	3	Always set
Cine Rate	(0018, 0040)	3	Always set
Actual Frame Duration	(0018, 1242)	3	Always set

10.2.10 Multi-frame Module

Table 50

Attribute Name	Tag	Type	Attribute Description
Number of Frame	(0028, 0008)	1	Always set
Frame Increment Pointer	(0028, 0009)	1	Always set

10.2.11 US Image Module

Table 51

Attribute Name	Tag	Type	Attribute Description
Sample Per Pixel	(0028, 0002)	1	Always set (3)
Photometric Interpretation	(0028, 0004)	1	Always set (“RGB”)
Bits Allocated	(0028,0100)	1	Always set (8)
Bits Stored	(0028, 0101)	1	Always set (8)
High Bit	(0028, 0102)	1	Always set (8)
Planar Configuration	(0028, 0006)	1	Always set (0)
Pixel Representation	(0028, 0103)	1	Always set (0)
Frame Increment Pointer	(0028, 0009)	1C	Always set (0x00181063)
Image Type	(0008, 0008)	2	Always set
Lossy Image Compression	(0028, 2110)	1C	Always set (0 or 1)
Ultrasound Color Data Present	(0028, 0014)	3	Always set (1)
Heart Rate	(0018, 1088)	3	Always set

10.2.12 SOP Common Module

Table 52

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008, 0016)	1	Always set
SOP Instance UID	(0008, 0018)	1	Always set
Specific Character Set	(0008, 0005)	1C	Always set (“ISO_IR 100”)

11 DIMSE-Service and Attributes

11.1 DIMSE-Services

Table 53

SOP Class	DIMSE Service Element	Reference	Usage SCU[1]
Basic Film Session SOP Class	N-CREATE	11.2.1	M
	N-SET	Not used	U
	N-DELETE	Used	U
	N-ACTION	Not used	U
Basic Film Box SOP Class	N-CREATE	11.3.1	M
	N-SET	Not used	U
	N-DELETE	Used	U
	N-ACTION	Used	M
Image Box SOP Class	N-SET	11.4.1 11.5.1	M
Printer SOP Class	N-EVENT-REPORT	Used	M
	N-GET	11.6.1	U

[1] M=Mandatory, U=User option

11.2 Basic Film Session SOP Class

11.2.1 N-CREATE Attributes

Table 54

Attribute Name	Tag	Usage	Attribute Description
Number of Copies	(2000,0010)	U	Always set
Print Priority	(2000,0020)	U	Always set
Media Type	(2000,0030)	U	Always set
Film Destination	(2000,0040)	U	Not set when no data is available
Film Session Label	(2000,0050)	U	Always set (“Not”)
Memory Allocation	(2000,0060)	U	Not set when no data is available

11.3 Basic Film Box SOP Class

11.3.1 N-CREATE Attributes

Table 55

Attribute Name	Tag	Usage	Attribute Description
Image Display Format	(2010,0010)	M	Always set
Film Orientation	(2010,0040)	U	Always set
Film Size ID	(2010,0050)	U	Always set
Magnification Type	(2010,0060)	U	Always set
Border Density	(2010,0100)	U	Always set
Empty Image Density	(2010,0110)	U	Always set
Trim	(2010,0140)	U	Always set
Referenced Film Session Sequence	(2010,0500)	M	Always set
>Referenced SOP Class UID	(0008,1150)	M	Always set
>Referenced SOP Instance UID	(0008,1155)	M	Always set

11.4 Basic Grayscale Image Box SOP Class

11.4.1 N-SET Attributes

Table 56

Attribute Name	Tag	Usage	Attribute Description
Image Position	(2020,0010)	M	Always set
Polarity	(2020,0020)	U	Always set
Magnification Type	(2010,0060)	U	Always set
Smoothing Type	(2010,0080)	U	Always set
Preformatted Grayscale Image Sequence	(2020,0110)	M	Always set
>Samples Per Pixel	(0028,0002)	M	Always set (1)
>Photometric Interpretation	(0028,0004)	M	Always set
>Rows	(0028,0010)	M	Always set
>Columns	(0028,0011)	M	Always set
>Pixel Aspect Ratio	(0028,0034)	M	Always set
>Bits Allocated	(0028,0100)	M	Always set (8)
>Bits Stored	(0028,0101)	M	Always set (8)
>High Bit	(0028,0102)	M	Always set (7)
>Pixel Representation	(0028,0103)	M	Always set (0)
>Pixel Data	(7FE0,0010)	M	Always set

11.5 Basic Color Image Box SOP Class

11.5.1 N-SET Attributes

Table 57

Attribute Name	Tag	Usage	Attribute Description
Image Position	(2020,0010)	M	Always set
Polarity	(2020,0020)	U	Always set
Magnification Type	(2010,0060)	U	Always set
Smoothing Type	(2010,0080)	U	Always set
Preformatted Color Image Sequence	(2020,0111)	M	Always set
>Samples Per Pixel	(0028,0002)	M	Always set (3)
>Photometric Interpretation	(0028,0004)	M	Always set
>Planar Configuration	(0028,0006)	M	Always set (0)
>Rows	(0028,0010)	M	Always set
>Columns	(0028,0011)	M	Always set
>Pixel Aspect Ratio	(0028,0034)	M	Always set
>Bits Allocated	(0028,0100)	M	Always set (8)
>Bits Stored	(0028,0101)	M	Always set (8)
>High Bit	(0028,0102)	M	Always set (7)
>Pixel Representation	(0028,0103)	M	Always set (0)
>Pixel Data	(7FE0,0010)	M	Always set

11.6 Printer SOP Class

11.6.1 N-GET Attributes

Table 58

Attribute Name	Tag	Usage SCU/SCP
Printer Status	(2110,0010)	U/M
Printer Status Info	(2110,0020)	U/M
Printer Name	(2110,0030)	U/U
Manufacturer	(0008,0070)	U/U
Manufacturer’s Model Name	(0008,1090)	U/U
Device Serial Number	(0018,1000)	U/U
Software Version	(0018,1020)	U/U
Date of Last Calibration	(0018,1200)	U/U
Time of Last Calibration	(0018,1201)	U/U