

DICOM Conformance Statement

for
TEAC
DICOM Gateway

UR-4MD

Ver.1.1

TEAC CORPORATION
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1. INTRODUCTION

1.1. Purpose of This Document

This document declares conformance to DICOM® 3.0 for the UR-4MD DICOM transfer function, the DICOM Gateway from TEAC CORPORATION.

This document addresses only the DICOM function of the components composed of Application Entities.

These DICOM standard compliance terms are applied to the DICOM SCU function, and address the transmission/reception structure and the transmission/reception method in order to transmit image information and receive MWM information to/from the devices compatible with DICOM 3.0. Neither other functions of the UR-4MD nor connection specifications out of the applicable range of DICOM 3.0 are described.

1.2. References

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

1.3. Acronyms and Abbreviations

- DICOM Digital Imaging and Communications in Medicine
- NEMA National Electrical Manufacturing Association
- AE Application Entity
- SCP Service Class Provider
- SCU Service Class User
- TCP/IP Transmission Control Protocol/Internet Protocol
- UID Unique Identifier

DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

2. IMPLEMENTATION MODEL

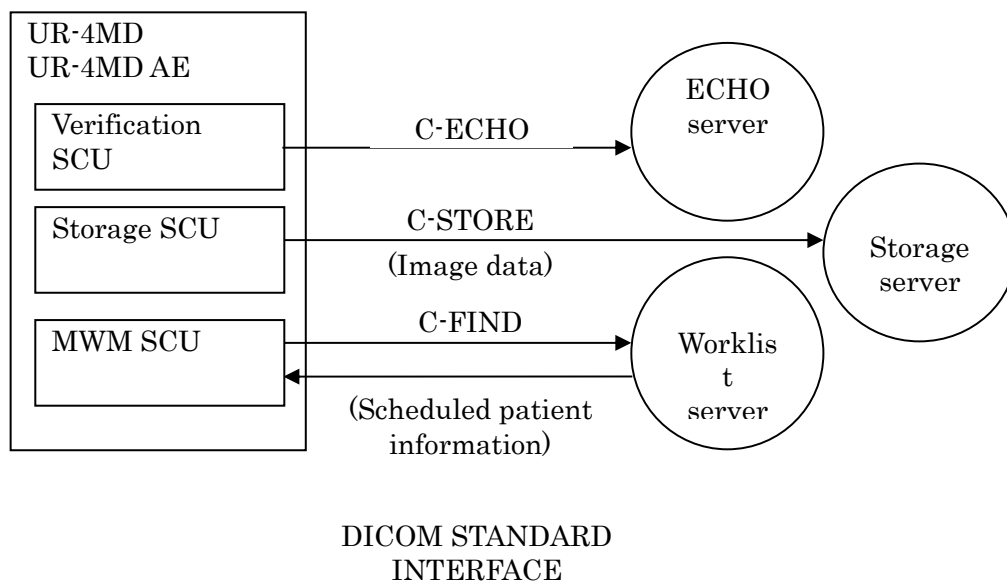
The UR-4MD has the following functions via Ethernet connected to the external DICOM server:

- Transfer Secondary Capture Image Information by using Storage Service Class.
- Select and initiate Study from Worklist by using Modality Worklist Management Service Class.

2.1. Application Data Flow Diagram

When Patient ID is input into the UR-4MD or a Worklist acquisition operation is performed (depending on setting), the UR-4MD AE initiates Association to external devices. Once Association is established here, the UR-4MD AE makes a request to the external Worklist server for verification in Modality, AE Title and so on. In the case of receiving a response result or occurrence of an error, this Association is terminated.

When an image storage request is generated in UR-4MD, the UR-4MD AE initiates Association to the external device. Once the Association is established here, the UR-4MD AE sends Secondary Capture Image to the external storage server. In the case of completing to transmit images or occurrence of an error, this Association is terminated.



2.2. Functional Definition of AEs

The AE of this device is supposed to generate an SCU instance and accept it at SCP by using the TCP/IP protocol stack and the DICOM transport protocol in order to send and receive information to and from the server on the network.

2.3. Sequencing of Real-World Activities

Not applicable.

2.4. AE Specifications

The Application Entity of this device provides standard conformance to the SOP classes as an SCU.

SOP Class Name acting as SCU	
SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31

3. AE SPECIFICATIONS

3.1. Association Establishment Policies

3.1.1. General

The parameters for negotiation with Application Entities, such as Host name, Port number, Server AE, etc., can be configured on the device.

3.1.2. Number of Associations

The storage supports multiple simultaneous Associations depending on settings.
The Worklist AE does not support multiple simultaneous Associations.

3.1.3. Asynchronous Nature

The Storage/Worklist AE does not support asynchronous processing.

3.1.4. Implementation Identifying Information

The implementation class UID of this device is 1.2.392.200235.40.1.
The implementation version name is the firmware version number of the UR-4MD.

3.2. Relationships among Associations in Real-World Activities

Associations are established by an establishment request to the Storage Service Class SCP.

3.2.1. Sequencing of Real-World Activities

The UR-4MD responds to Request Sequence of the Storage Service Class SCU.

3.2.2. Presentation Contexts

The Storage/Worklist AE proposes only the following presentation contexts shown below.

Presentation Context					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
NAME	UID	NAME LIST	UID LIST		
Verification	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Still Image Storage	1.2.840.10008.5.1.4.1.1.7	Lossy JPEG 8Bit Base Line	1.2.840.10008.1.2.4.50	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Modality Worklist	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		

3.3. Client Activity

3.3.1. Client Activity of Verification SOP

3.3.1.1. Associated Real-World Activity

The verification service is activated when an echo verification instruction is given to the UR-4MD connected to the UR-4MD Modality.

The UR-4MD establishes Association by sending A-ASSOCIATE-RQ PDU to the DICOM AE supporting SCP of the configured verification service class and receiving A-ASSOCIATE-AC PDU from it.

When sending the C-ECHO-RQ message by P-DATA TF and then receiving the C-ECHO-RSP message, the UR-4MD sends A-RELEASE-RQ PDU, releases Association by receiving A-RELEASE-RSP PDU, and completes the verification service.

3.3.2. Client Activity of Modality Worklist Management SOP

3.3.2.1. Associated Real-World Activity

The Modality Worklist Management Service is activated when a Worklist Retrieve instruction is given to the UR-4MD connected to the Modality.

The UR-4MD establishes Association by sending A-ASSOCIATE-RQ PDU to the DICOM AE supporting SCP of the configured Modality Worklist Management Service Class and receiving A-ASSOCIATE-AC PDU from it.

When sending the Matching key module of C-FIND-RSP message and the Modality Worklist Management IOD by P-DATA TF and then receiving the C-FIND-RSP message and Return Key Module, the UR-4MD sends A-RELEASE-RQ PDU, releases Association by receiving A-RELEASE-RSP PDU, and completes the Modality Worklist Management Service.

3.3.2.2. Conformance for Modality Worklist Management SOP Class

The IOD Module used in the Modality Worklist AE conforms as a SCU of the standard DICOM Modality Worklist Management Class.

The Information Modules comprising the Modality Worklist Management IOD are listed below.

Module	Matching Key Type	Return Key Type	Use Situation
SOP Common	O	1C	Used
Scheduled Procedure Step	R	1	Used
Requested Procedure	O	1	Used
Imaging Service Request	O	1	Used
Patient Relationship	O	3	Not used
Patient Identification	R	1	Used
Patient Description	O	2	Used
Patient Medical	O	2	Used

Visit Relationship	O	2	Not used
Visit Identification	O	2	Not used
Visit Status	O	2	Not used
Visit Admission	O	3	Not used

3.3.2.2.1. SOP Commom IOD Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0008,0005)	Specific Character Set	CS	O	1C	Requested with Specific Character Set
(0008,0016)	SOP Class UID	CS	O	3	Requested with "1.2.840.10008.5.1.4.31". Response not used.

3.3.2.2.2. Scheduled Procedure Step Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0040,0100)	Scheduled Procedure Step Sequence	SQ	R	1	
(0008,0060)	Modality	CS	R	1	Requested with Modality. Response is reflected in SC image IOD.
(0040,0001)	Scheduled Station AE Title	AE	R	1	Requested with AE Title. Response not used.
(0040,0002)	Scheduled Procedure Step Start Date	DA	R	1	Requested with Study date. Response not used.
(0040,0003)	Scheduled Procedure Step Start Time	TM	R	1	Requested with "000000-235959" or "". Response not used.
(0040,0006)	Scheduled Performing Physician's Name	PN	R	2	Requested with "". Response not used.
(0040,0007)	Scheduled Procedure Step Description	LO	O	1C	Requested with "" Response is reflected in Body Part Examined (0018, 0015), Protocol Name (0018, 1030) and Study Description (0008,1030) by setting.

3.3.2.2.3. Requested Procedure Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0018,0015)	Body Part Examined	CS	O	1	Requested with “”. Response not used.
(0020,000D)	Study Instance UID	UI	O	1	Requested with “”. Response is reflected in SC image IOD
(0032,1060)	Requested Procedure Description	LO	O	1C	Requested with “”. Response is reflected in Body Part Examined (0018, 0015), Protocol Name (0018, 1030) and Study Description (0008,1030) by setting.

3.3.2.2.4. Imaging Service Request Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0008,0050)	Accession Number	SH	O	2	Requested with “”. Response is reflected in SC Image IOD
(0008,0090)	Referring Physician's Name	PN	O	2	Requested with “”. Response not used.

3.3.2.2.5. Patient Identification Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0010,0010)	Patient's Name	PN	R	1	Requested with “”. Response is reflected in SC Image IOD
(0010,0020)	Patient ID	LO	R	1	Requested with Patient ID Response is reflected in SC Image IOD

3.3.2.2.6. Patient Demographic Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0010,0030)	Patient's Birth Date	DA	O	2	Requested with “”. Response is reflected in SC Image IOD
(0010,0040)	Patient's Sex	CS	O	2	Requested with “”. Response is reflected in SC Image IOD

3.3.2.2.7. Patient Medical Module

Tag	Attribute Name	VR	Matching Key Type	Return Key Type	Description
(0038,0050)	Special Needs	LO	O	2	Requested with “”. Response not used.
(0038,0500)	Patient State	LO	O	2	Requested with “”. Response not used.

3.3.3. Client Activity of Secondary Capture Image Storage SOP

3.3.3.1. Associated Real-World Activity

The Secondary Capture Image Storage Service is activated when a new image is registered in the UR-4MD.

The UR-4MD establishes Association by sending A-ASSOCIATE-RQ PDU to the DICOM AE supporting SCP of the configured Storage Service Class and receiving A-ASSOCIATE-AC PDU from it.

When sending the C-STORE-RQ message and the Secondary Capture Image IOD Module by P-DATA TF and then receiving the C-STORE-RSP message, the UR-4MD sends A-RELEASE-RQ PDU, releases Association by receiving A-RELEASE-RSP PDU, and completes the Secondary Capture Image Storage Service.

3.3.3.2. Conformance for Secondary Capture Image Storage SOP Class

The IOD Module used in the Secondary Capture Image Storage AE conforms as a SCU of the standard DICOM Storage SOP Class of the Secondary Capture Image IOD.

The information modules comprising the Secondary Capture Image IOD are listed below.

IE	Module	Usage	Usage conditions
Patient	Patient	Required	Used
Study	General Study	Required	Used
	Patient Study	Option	Not used
Series	General Series	Required	Used
Equipment	General Equipment	Option	Used
	SC Equipment	Required	Used
Image	General Image	Required	Used
	Image Pixel	Required	Used
	SC Image	Required	Used
	Overlay Plane	Option	Not used
	Modality LUT	Option	Not used
	VOI LUT	Option	Not used
	SOP Common	Required	Used

3.3.3.2.1. Patient IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,1120)	Referenced Patient Sequence	SQ	3	(Not used)
(0010,0010)	Patient's Name	PN	2	The Roman Alphabet
(0010,0020)	Patient ID	LO	2	Identification Number
(0010,0030)	Patient's Birth Date	DA	2	Birth Date (A.D.)
(0010,0032)	Patient's Birth Time	TM	3	(Not used)
(0010,0040)	Patient's Sex	CS	2	Configurable
(0010,1000)	Other Patient IDs	LO	3	(Not used)
(0010,1001)	Other Patient Names	PN	3	(Not used)

(0010,2160)	Ethnic Group	SH	3	(Not used)
(0010,4000)	Patient Comments	LT	3	(Not used)

3.3.3.2.2. General Study IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,0020)	Study Date	DA	2	Date the Study started
(0008,0030)	Study Time	TM	2	Time the Study started
(0008,0050)	Accession Number	SH	2	Accession Number
(0008,0090)	Referring Physician's Name	PN	2	No value
(0008,1030)	Study Description	LO	3	When acquiring from MWM, set the value of (0032, 1060) "Requested Procedure Description" or (0040,0007) "Scheduled Procedure Step Description"
(0008,1060)	Name of Physician(s) Reading Study	PN	3	(Not used)
(0008,1110)	Referenced Study Sequence	SQ	3	(Not used)
(0020,000D)	Study Instance UID	UI	1	Unique identifier for study
(0020,0010)	Study ID	SH	2	Study ID

3.3.3.2.3. Patient Study IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,1080)	Admitting Diagnoses Description	LO	3	(Not used)
(0010,1010)	Patient's Age	AS	3	(Not used)
(0010,1020)	Patient's Size	DS	3	(Not used)
(0010,1030)	Patient's Weight	DS	3	(Not used)
(0010,2180)	Occupation	SH	3	(Not used)
(0010,21B0)	Additional Patient History	LT	3	(Not used)

3.3.3.2.4. General Series IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,0021)	Series Date	DA	3	Date the Series started
(0008,0031)	Series Time	TM	3	Time the Series started
(0008,0060)	Modality	CS	1	Configurable
(0008,103E)	Series Description	LO	3	(Not used)
(0008,1050)	Performing Physician's Name	PN	3	(Not used)
(0008,1070)	Operators' Name	PN	3	(Not used)
(0008,1111)	Referenced Performed Procedure Step	SQ	3	(Not used)

	Sequence			
(0018,0015)	Body Part Examined	CS	3	Configurable. When acquiring from MWM, set the value of (0032, 1060) "Requested Procedure Description" or (0040,0007) "Scheduled Procedure Step Description".
(0018,1030)	Protocol Name	LO	3	Configurable. When acquiring from MWM, set the value of (0032, 1060) "Requested Procedure Description" or (0040,0007) "Scheduled Procedure Step Description".
(0018,5100)	Patient Position	CS	2C	(NA)
(0020,000E)	Series Instance UID	UI	1	Unique identifier of the Series
(0020,0011)	Series Number	IS	2	Generated sequentially
(0020,0060)	Laterality	CS	2C	No value
(0028,0108)	Smallest Pixel Value in Series	US	3	(Not used)
(0028,0109)	Largest Pixel Value in Series	US	3	(Not used)

3.3.3.2.5. General Equipment IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,0070)	Manufacturer	LO	2	(Not used)
(0008,0080)	Institution Name	LO	3	Configurable
(0008,0081)	Institution Address	ST	3	(Not used)
(0008,1010)	Station Name	SH	3	Configurable
(0008,1040)	Institutional Department Name	LO	3	(Not used)
(0008,1090)	Manufacturer's Model Name	LO	3	Configurable
(0018,1000)	Device Serial Number	LO	3	(Not used)
(0018,1020)	Software Version(s)	LO	3	(Not used)
(0018,1050)	Spatial Resolution	DS	3	(Not used)
(0018,1200)	Date of Last Calibration	DA	3	(Not used)
(0018,1201)	Time of Last Calibration	TM	3	(Not used)
(0028,0120)	Pixel Padding Value	US	3	(Not used)

3.3.3.2.6. Secondary Capture Equipment IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,0060)	Modality	CS	3	Configurable
(0008,0064)	Conversion Type	CS	1	“DV”
(0018,1010)	Secondary Capture Device ID	LO	3	Configurable
(0018,1016)	Secondary Capture Device Manufacturer	LO	3	“TEAC CORP”
(0018,1018)	Secondary Capture Device Manufacturer's Model Name	LO	3	“UR4MD”
(0018,1019)	Secondary Capture Device Software Versions	LO	3	Use of firmware version
(0018,1022)	Video Image Format Acquired	SH	3	Depends on images
(0018,1023)	Digital Image Format Acquired	LO	3	(Not used)

3.3.3.2.7. General Image IOD Module

Tag	Attribute Name	VR	Type	Description
(0008,0008)	Image Type	CS	3	“DERIVED†SECONDARY”
(0008,0022)	Acquisition Date	DA	3	(Not used)
(0008,0023)	Content Date	DA	2C	Date when the image was acquired
(0008,0032)	Acquisition Time	TM	3	(Not used)
(0008,0033)	Content Time	TM	2C	Time when image was acquired
(0008,1140)	Referenced Image Sequence	SQ	3	(Not used)
(0028,2110)	Lossy Image Compression	CS	3	“00” = Uncompressed “01” = Compressed
(0008,2111)	Derivation Description	ST	3	No value
(0008,2112)	Source Image Sequence	SQ	3	(Not used)
(0020,0012)	Acquisition Number	IS	3	(Not used)
(0020,0013)	Instance Number	IS	2	Generated sequentially
(0020,0020)	Patient Orientation	CS	2C	No value
(0020,1002)	Images in Acquisition	IS	3	(Not used)
(0020,4000)	Image Comments	LT	3	(Not used)

3.3.3.2.8. Image Pixel IOD Module

Tag	Attribute Name	VR	Type	Description
(0028,0002)	Samples per Pixel	US	1	3
(0028,0004)	Photometric Interpretation	CS	1	“RGB” = Uncompressed “YBR_FULL 422” = JPEG
(0028,0006)	Planar Configuration	US	1C	0

(0028,0010)	Rows	US	1	Depends on recorded images
(0028,0011)	Columns	US	1	Depends on recorded images
(0028,0034)	Pixel Aspect Ratio	IS	1C	“1¥1”
(0028,0100)	Bits Allocated	US	1	8
(0028,0101)	Bits Stored	US	1	8
(0028,0102)	High Bit	US	1	7
(0028,0103)	Pixel Representation	US	1	0
(0028,0106)	Smallest Image Pixel Value	US	3	(Not used)
(0028,0107)	Largest Image Pixel Value	US	3	(Not used)
(7FE0,0010)	Pixel Data	OB	1	Pixel Data

3.3.3.2.9. Secondary Capture Image IOD Module

Tag	Attribute Name	VR	Type	Description
(0018,1012)	Date of Secondary Capture	DA	3	No value
(0018,1014)	Time of Secondary Capture	TM	3	No value

3.3.3.2.10. SOP COMMON IOD MODULE

Tag	Attribute Name	VR	Type	Description
(0008,0005)	Specific Character Set	CS	1C	Configurable
(0008,0012)	Instance Creation Date	DA	3	(Not used)
(0008,0013)	Instance Creation Time	TM	3	(Not used)
(0008,0014)	Instance Creator UID	UI	3	(Not used)
(0008,0016)	SOP Class UID	UI	1	1.2.840.10008.5.1.4.1.1.7
(0008,0018)	SOP Instance UID	UI	1	1.2.392.200235.40.1~

4. COMMUNICATION PROFILES

4.1. Supported Communications Stacks

The UR-4MD provides DICOM V3.0 TCP/IP network communication support as defined in Part 8 of the DICOM standard.

4.2. TCP/IP Stack

This device inherits the TCP/IP protocol stack through the Linux socket interface.

4.3. Physical Media

This device is connected to a physical medium via Ethernet (10Base-T), Fast Ethernet (100Base-TX) and Gigabit Ethernet (1000Base-T).

4.4. Point to Point Stack

Not supported

5. EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

5.1. Extensions

Not applicable

5.2. Privatizations

Not applicable

6. CONFIGURATION

This device can change the parameters of the following table.

6.1. Common Configuration

Items	Contents
Station (Name)	Set Station Name
Institution (Name)	Set Institution Name
Manufacturer's Model (Name)	Set Manufacturer's Model Name
SC (Secondary Capture) Image Device ID	Set Secondary Capture Device ID
PDU Size	Set PDU Size
Modality	Set Modality Name
(Storage) Transfer Retry Count	Specify retry times for storage
Numbering - Gender	Specify conversion rules for values to treat as gender

6.2. Storage Configuration

Items	Contents
Mode	Enable/disable setting of functions
IP address	Set the server IP address
Port	Set the server port number
AE title	Set the server AE Title
Calling AE title	Set the UR-4MD AE Title

6.3. Worklist Configuration

Items	Contents
Mode	Enable/disable setting of functions
Value Representations	Explicit/implicit setting of VR
IP address	Set the server IP address
Port	Set the server port number
AE title	Set the server AE Title
Calling AE title	Set the UR-4MD AE Title
Requested Date	Setting for whether to use the date as a key when searching
Requested Scheduled (Station) AE title	Setting for whether to use the Scheduled AE Title as a key when retrieving
Requested Modality	Setting for whether to use the Modality as a key when retrieving
Body part examined	Specify the tag to be used as Examined Body

7. SUPPORT FOR EXTENDED CHARACTER SETS

Extended character repertoire adapts default characters.

8. REVISION HISTORY

[illegible]