



KONICA MINOLTA

SONIMAGE MX1

**ULTRASOUND SYSTEM
SONIMAGE MX1**

**DICOM3.0
Conformance
Statement**



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1 INTRODUCTION

This document declares conformity of ULTRASOUND DIAGNOSTIC SYSTEM SONIMAGE MX1 (hereinafter, MX1) to DICOM3.0.

1.1 Important Notes

This manual does not guarantee the proper function or performance of the interactive operation between the MX1 and other interfaced devices. Please note the followings.

Connection Test

When the MX1 is used in connection with other devices, implement the connection test by referring to each DICOM conformance statement before start using the system, and confirm the data consistency and its stability. Specifically make sure to firmly confirm the consistency between the basic information of the Patient/Study/Image and the pixel size of the images.

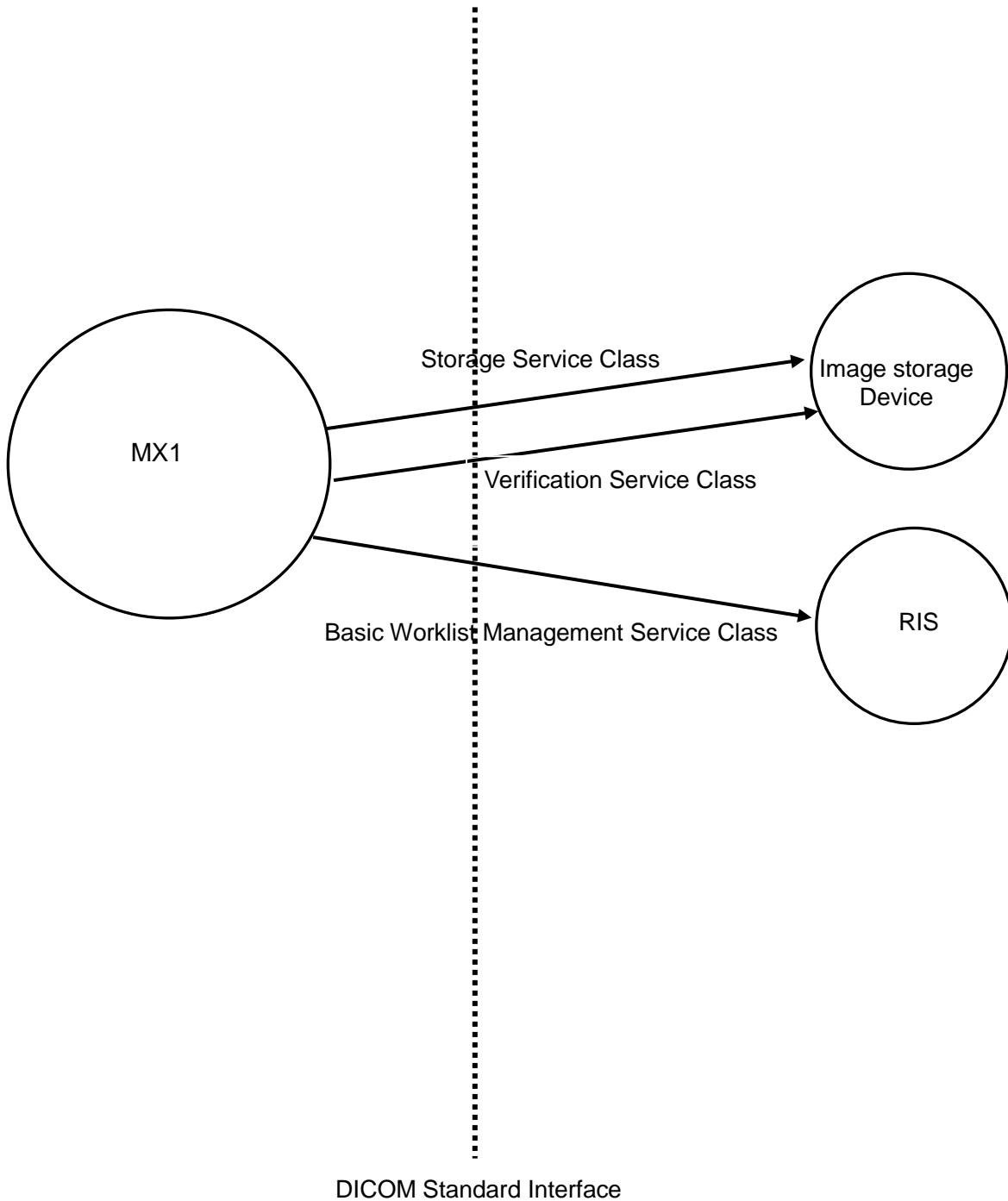
Revision of DICOM Standard

The DICOM standard is annually revised due to diversified operation and introduction of new technology, etc. Please note this may cause a loss of compatibility or connectivity as the result of upgrade of DICOM module in MX1 or connected module after the MX1 has been installed.

2 IMPLEMENTATION MODEL

The MX1 functions as an SCU for the Storage Service Class.
The MX1 functions as an SCU for the Verification Service Class.
The MX1 functions as an SCU for the Basic Worklist Management Service Class.

2.1 Application Data Flow Diagram



2.2 Functional Definitions of AE's

2.2.1 Verification Service Class SCU

The MX1 Verification Service Class SCU operates as a communication process, and issues a C-ECHO-RQ to an external AE.

2.2.2 Storage Service Class SCU

The MX1 Storage Service Class SCU operates as a communication process. After receiving an association request for an external AE, it stores the image in image storage device according to C-STORE.

2.2.3 Basic Worklist Management Service Class SCU

The MX1 Basic Worklist Management Service Class SCU operates as a communication process. After receiving an association request for an external AE, it retrieves the Patient/Study Information from RIS according to C-FIND.

2.2.4 Media Storage

The MX1 Media Storage has following functions:

- Writing a collection of DICOM files to the medium
- Updating a medium by adding a new SOP instance to a collection of DICOM files that has already been existed

2.3 Sequencing of Real World Activities

Sequencing of real world activities is not supported.

3 AE Specifications

3.1 Verification Service Class SCU Specifications

The MX1 supports the following SOP classes as Verification Service Class SCU.

SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1

3.1.1 Association Establishment Policies

Conditions for establishing association are described below.

3.1.1.1 General

The MX1 Verification Service Class SCU recognizes and uses the following application context name.

Description	Value
Application Context Name	1.2.840.10008.3.1.1.1

The initial and maximum PDU size is 64 KB.

3.1.1.2 Number of Associations

The MX1 Verification Service Class SCU issues a single association request at one time for the external AE that is implemented as a separate device.

3.1.1.3 Asynchronous Nature

Asynchronous processing is not supported.

3.1.1.4 Implementation Identifying Information

Description	Value
Implementation Class UID	1.2.392.200036.9107.804
Implementation Version Name	KM_SMGMX1_1.00

3.1.2 Real World Activities

3.1.2.1 Presentation Context Tables

The following presentation contexts will be proposed as required.

Abstract Syntax			
Name	UID	Role	Extended Negotiation
Verification	1.2.840.10008.1.1	SCU	None

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

3.2 Storage Service Class SCU Specifications

The MX1 supports the following SOP classes as Storage Service Class SCU.

SOP Class Name	SOP Class UID
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
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7

3.2.1 Association Establishment Policies

Conditions for establishing association are described below.

3.2.1.1 General

The MX1 Storage Service Class SCU recognizes and uses the following application context name.

Description	Value
Application Context Name	1.2.840.10008.3.1.1.1

The initial and maximum PDU size is 64 KB.

3.2.1.2 Number of Associations

The MX1 Storage Service Class SCU issues a single association request at one time for the external AE that is implemented as a separate device.

3.2.1.3 Asynchronous Nature

Within the association, only a single image is handled. Asynchronous processing is not supported.

3.2.1.4 Implementation Identifying Information

Description	Value
Implementation Class UID	1.2.392.200036.9107.804
Implementation Version Name	KM_SMGMX1_1.00

3.2.2 Real World Activities

3.2.2.1 Associated Real World Activity

The relevant activity in the real world is issuing an Ultrasound image and Secondary Capture image C-STORE request to the Storage Service Class SCP.

3.2.2.2 Presentation Context Tables

The following presentation contexts will be proposed as required.

Abstract syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		JPEG Lossless	1.2.840.10008.1.2.4.70		
		JPEG Lossy Baseline	1.2.840.10008.1.2.4.50		
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		JPEG Lossy Baseline	1.2.840.10008.1.2.4.50		
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
		JPEG Lossless	1.2.840.10008.1.2.4.70		
		JPEG Lossy Baseline	1.2.840.10008.1.2.4.50		
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.2.3 Ultrasound Image Storage SOP Class

This model conforms to the Ultrasound Image Storage, Ultrasound Multi-frame Image Storage, Secondary Capture Image Storage SOP Class.

The MX1 uses C-STORE to store image data on an image storage device (SCP).

Behavior : For SOP instances matching the Ultrasound Image, Ultrasound Multi-Frame Image, SC Image IOD request, the MX1 executes the C-STORE DIMSE service.

The MX1 recognizes the C-STORE response status and takes appropriate action depending on whether the service terminated normally or not.

Ultrasound Image IOD Modules

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
	Patient Study	U
Series	General Series	M
Equipment	General Equipment	M
Image	General Image	M
	Image Pixel	M
	US Region Calibration	U
	US Image	M
	SOP Common	M

Ultrasound Multi-Frame Image IOD Modules

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
	Patient Study	U
Series	General Series	M
Equipment	General Equipment	M
Image	General Image	M
	Image Pixel	M
	Cine	C
	Multi-Frame	M
	US Region Calibration	U
	US Image	M
	SOP Common	M

SC Image IOD Modules

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
	Patient Study	U
Series	General Series	M
Equipment	General Device	U
	SC Equipment	M
Image	General Image	M
	Image Pixel	M
	SC Image	M
	SOP Common	M

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Patient				
Tag	Attribute Name	VR	VM	Type
(0010,0010)	Patient's Name	PN	1	2
(0010,0020)	Patient's ID	LO	1	2
(0010,0030)	Patient's Birth Date	DA	1	2
(0010,0040)	Patient's Sex	CS	1	2
(0010,4000)	Patient Comments	LT	1	3

General Study				
Tag	Attribute Name	VR	VM	Type
(0020,000D)	Study Instance UID	UI	1	1
(0008,0020)	Study Date	DA	1	2
(0008,0030)	Study Time	TM	1	2
(0008,0090)	Referring Physician's Name	PN	1	2
(0020,0010)	Study ID	SH	1	2
(0008,0050)	Accession Number	SH	1	2
(0032,4000)	Study Comment	LT	1	3

Patient Study				
Tag	Attribute Name	VR	VM	Type
(0010,1010)	Patient's Age	AS	1	3
(0010,1020)	Patient's Size	DS	1	3
(0010,1030)	Patient's Weight	DS	1	3

General Series				
Tag	Attribute Name	VR	VM	Type
(0008,0060)	Modality	CS	1	1
(0020,000E)	Series Instance UID	UI	1	1
(0020,0011)	Series Number	IS	1	2
(0008,0021)	Series Date	DA	1	3
(0008,0031)	Series Time	TM	1	3
(0008,103E)	Series Description	LO	1	3
(0008,1070)	Operators' Name	PN	1	3
(0040,0253)	Performed Procedure Step ID	SH	1	3
(0040,0244)	Performed Procedure Step Start Date	DA	1	3
(0040,0245)	Performed Procedure Step Start Time	TM	1	3
(0040,0254)	Performed Procedure Step Description	LO	1	3

General Equipment				
Tag	Attribute Name	VR	VM	Type
(0008,0070)	Manufacturer	LO	1	2
(0008,0080)	Institution Name	LO	1	3
(0008,1010)	Station Name	SH	1	3
(0008,1090)	Manufacturer's Model Name	LO	1	3
(0018,1000)	Device Serial Number	LO	1	3
(0018,1020)	Software Versions	LO	4	3

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General Image				
Tag	Attribute Name	VR	VM	Type
(0020,0013)	Instance Number	IS	1	2
(0020,0020)	Patient Orientation	CS	2	2C
(0008,0023)	Content Date	DA	1	2C
(0008,0033)	Content Time	TM	1	2C
(0008,0008)	Image Type(*1)	CS	2	3
(0008,0022)	Acquisition Date	DA	1	3
(0008,0032)	Acquisition Time	TM	1	3
(0008,002A)	Acquisition Datetime	DT	1	3
(0028,2110)	Lossy Image Compression	CS	1	3
(0028,2112)	Lossy Image Compression Ratio	DS	1-n	3
(0028,2114)	Lossy Image Compression Method	CS	1-n	3

Image Pixel				
Tag	Attribute Name	VR	VM	Type
(0028,0002)	Samples per Pixel	US	1	1
(0028,0004)	Photometric Interpretation	CS	1	1
(0028,0010)	Rows	US	1	1
(0028,0011)	Columns	US	1	1
(0028,0100)	Bits Allocated	US	1	1
(0028,0101)	Bits Stored	US	1	1
(0028,0102)	High Bit	US	1	1
(0028,0103)	Pixel Representation	US	1	1
(7FE0,0010)	Pixel Date	OB	1	1

US Region Calibration				
Tag	Attribute Name	VR	VM	Type
(0018,6011)	Sequence of Ultrasound Regions	SQ	1	1
>(0018,6018)	Region Location Min X0(*1)	UL	1	1
>(0018,601A)	Region Location Min Y0(*1)	UL	1	1
>(0018,601C)	Region Location Max X1(*1)	UL	1	1
>(0018,601E)	Region Location Max Y1(*1)	UL	1	1
>(0018,6024)	Physical Units X Direction(*1)	US	1	1
>(0018,6026)	Physical Units Y Direction(*1)	US	1	1
>(0018,602C)	Physical Delta X(*1)	FD	1	1
>(0018,602E)	Physical Delta Y(*1)	FD	1	1
>(0018,6020)	Reference Pixel X0(*1)	SL	1	3
>(0018,6022)	Reference Pixel Y0(*1)	SL	1	3
>(0018,6028)	Ref. Pixel Physical Value X(*1)	FD	1	3
>(0018,602A)	Ref. Pixel Physical Value Y(*1)	FD	1	3
>(0018,6012)	Region Spatial Format(*1)	US	1	1
>(0018,6014)	Region Data Type(*1)	US	1	1
>(0018,6016)	Region Flags(*1)	UL	1	1

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US Image				
Tag	Attribute Name	VR	VM	Type
(0028,0006)	Planar	US	1	1C
(0028,0014)	Ultrasound Color Data Present	US	1	3

SOP Common				
Tag	Attribute Name	VR	VM	Type
(0008,0016)	SOP Class UID	UI	1	1
(0008,0018)	SOP Instance UID	UI	1	1
(0008,0005)	Specific Character Set	CS	2-3	1C

Cine				
Tag	Attribute Name	VR	VM	Type
(0018,1063)	Frame Time	DS	1	1C
(0008,2142)	Start Trim	IS	1	3
(0008,2143)	Stop Trim	IS	1	3
(0008,2144)	Recommended Display Frame Rate	IS	1	3
(0018,0040)	Cine Rate	IS	1	3
(0018,0072)	Effective Duration	DS	1	3
(0018,1242)	Actual Frame Duration	IS	1	3

Multi-Frame				
Tag	Attribute Name	VR	VM	Type
(0028,0008)	Number of Frames	IS	1	2
(0028,0009)	Frame Increment Pointer	AT	1-n	1C

SC Image				
Tag	Attribute Name	VR	VM	Type
(0018,1012)	Data of Secondary Capture	DA	1	3
(0018,1014)	Time of Secondary Capture	TM	1	3

SC Equipment				
Tag	Attribute Name	VR	VM	Type
(0008,0064)	Conversion Type	CS	1	1

(*1) In case of Ultrasound Multi-frame Image Storage SOP Class, a value of the last frame is to be stored.

3.3 Basic Worklist Management Service Class SCU Specifications

The MX1 supports the following SOP classes as Basic Worklist Management Service Class SCU.

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

3.3.1 Association Establishment Policies

3.3.1.1 General

The MX1 Basic Worklist Management Service Class SCU recognizes and uses the following Application context name.

Description	Value
Application Context Name	1.2.840.10008.3.1.1.1

The initial and maximum PDU size is 64 KB.

3.3.1.2 Number of Associations

The MX1 Basic Worklist Management Service Class SCU issues a single association request at one time for the external AE that is implemented as a separate device.

3.3.1.3 Asynchronous Nature

Asynchronous processing is not supported.

3.3.1.4 Implementation Identifying Information

Description	Value
Implementation Class UID	1.2.392.200036.9107.804
Implementation Version Name	KM_SMGMX1_1.00

3.3.2 Real World Activities

3.3.2.1 Associated Real World Activity

The relevant activity of the MX1 Basic Worklist Management in the real world where an association has been established is issuing a C-FIND request to the Remote Basic Worklist Management Service Class SCP, to retrieve patient and study information.

3.3.2.2 Presentation Context Tables

The MX1 Basic Worklist Management Service Class SCU performs requests with the following Presentation Contexts.

Abstract syntax			
Name	UID	Role	Extended Negotiation
Modality Worklist Information Model- FIND	1.2.840.10008.5.1.4.31	SCU	None

Transfer Syntax	
Name	UID
Implicit VR Little Endian	1.2.840.10008.1.2

3.3.3 Modality Worklist Attributes

3.3.3.1 Matching Key Attributes

Tag	Attribute Name	VR	VM	Matching Key Type	Return Key Type
SOP Common					
(0008,0005)	Specific Character Set	CS	1-n	O	1C
Scheduled Procedure Step					
(0040,0100)	Scheduled Procedure Step Sequence	SQ	1	R	1
>(0040,0001)	Scheduled Station AE Title	AE	1-n	R	1
>(0040,0002)	Scheduled Procedure Step Start Date	DA	1	R	1
>(0008,0060)	Modality	CS	1	R	1
Imaging Service Request					
(0008,0050)	Accession Number	SH	1	O	2
Patient Identification					
(0010,0010)	Patient's Name	PN	1	R	1
(0010,0020)	Patient's ID	LO	1	R	1

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3.3.3.2 Return Key Attributes

Tag	Attribute Name	VR	VM	Matching Key Type	Return Key Type
SOP Common					
(0008,0005)	Specific Character Set	CS	1-n	O	1C
Scheduled Procedure Step					
(0040,0100)	Scheduled Procedure Step Sequence	SQ	1	R	1
>(0040,0001)	Scheduled Station AE Title	AE	1-n	R	1
>(0040,0002)	Scheduled Procedure Step Start Date	DA	1	R	1
>(0040,0003)	Scheduled Procedure Step Start Time	TM	1	R	1
>(0008,0060)	Modality	CS	1	R	1
>(0040,0006)	Scheduled Performing Physician's Name	PN	1	R	2
>(0040,0007)	Scheduled Procedure Step Description	LO	1	O	1C
>(0040,0008)	Scheduled Protocol Code Sequence	SQ	1	O	1C
>>(0008,0100)	Code Value	SH	1	O	1C
>>(0008,0103)	Coding Scheme Version	SH	1	O	3
>>(0008,0102)	Coding Scheme Designator	SH	1	O	1C
>>(0008,0104)	Code Meaning	LO	1	O	3
>(0040,0009)	Scheduled Procedure Step ID	SH	1	O	1
>(0032,1070)	Requested Contrast Agent	LO	1	O	2C
	All other attributes from the Scheduled Procedure Step Module			O	
Requested Procedure					
(0040,1001)	Requested Procedure ID	SH	1	O	1
(0032,1060)	Requested Procedure Description	LO	1	O	1C
(0032,1064)	Requested Procedure Code Sequence	SQ	1	O	1C
>(0008,0100)	Code Value	SH	1	O	1C
>(0008,0102)	Coding Scheme Designator	SH	1	O	1C
>(0008,0103)	Coding Scheme Version	SH	1	O	3
>(0008,0104)	Code Meaning	LO	1	O	3
(0020,000D)	Study Instance UID	UI	1	O	1
	All other attributes from the Requested Procedure Module			O	
Imaging Service Request					
(0008,0050)	Accession Number	SH	1	O	2
(0032,1032)	Requesting Physician	PN	1	O	2
(0008,0090)	Referring Physician's Name	PN	1	O	2
	All other attributes from the Imaging Service Request Module			O	
Patient Identification					
(0010,0010)	Patient's Name	PN	1	R	1
(0010,0020)	Patient ID	LO	1	R	1
	All other attributes from the Patient Identification Module			O	
Patient Demographic					
(0010,0030)	Patient's Birth Date	DA	1	O	2
(0010,0040)	Patient's Sex	CS	1	O	2
(0010,1010)	Patient's Age	AS	1	O	3
(0010,1020)	Patient's Size	DS	1	O	3
(0010,1030)	Patient's Weight	DS	1	O	2
(0010,4000)	Patient Comments	LT	1	O	3
	All other attributes from the Patient Demographic Module			O	

Patient Medical					
(0010,2000)	Medical Alerts	LO	1-n	O	2
(0010,2110)	Contrast Allergies	LO	1-n	O	2
(0010,21C0)	Pregnancy Status	US	1	O	2
(0010,21D0)	Last Menstrual Date	DA	1	O	3
(0038,0050)	Special Needs	LO	1	O	2
(0038,0500)	Patient State	LO	1	O	2
	All other attributes from the Patient Medical Module			O	

3.4 Specifications of Media Storage

3.4.1 File Meta Information for the Application Entity

Content	Value
Implementation Class UID	1.2.392.200036.9107.804
Implementation Version Name	KM_SMGMX1_1.00

3.4.2 Real World Activities

3.4.2.1 Associated Real World Activity

MX1 Media Storage does the followings:

- Export Image Files
Working as FSC that uses the interchange option in which direction for creating USB/SD is present, with user operations.
- Add Image Files
Working as FSU that uses the interchange option in which direction for updating USB/SD is present, with user operations.

3.4.2.2 SOP Class Specifications

IOD and Transfer Syntax for STD-GEN-USB/STD-GEN-SD

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2
		Explicit VR Little Endian	1.2.840.10008.1.2.1
		Explicit VR Big Endian	1.2.840.10008.1.2.2
		JPEG Lossless	1.2.840.10008.1.2.4.70
		JPEG Lossy Baseline	1.2.840.10008.1.2.4.50
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
		Explicit VR Little Endian	1.2.840.10008.1.2.1
		Explicit VR Big Endian	1.2.840.10008.1.2.2
		JPEG Lossy Baseline	1.2.840.10008.1.2.4.50

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Secondary Capture Image Storage	1.2.840.10008.5.1.4.1. 1.7	Implicit VR Little Endian	1.2.840.10008.1.2
		Explicit VR Little Endian	1.2.840.10008.1.2.1
		Explicit VR Big Endian	1.2.840.10008.1.2.2
		JPEG Lossless	1.2.840.10008.1.2.4.70
		JPEG Lossy Baseline	1.2.840.10008.1.2.4.50

4 Communication Profiles

4.1 Supported Communication Stacks

MX1 provides the TCP/IP network communication support defined by the DICOM3.0 PART8.

4.2 TCP/IP Stack

The TCP/IP stack is inherited from the Windows system environment.

4.2.1 Physical Media Support

1000BASE-T, 100BASE-T and 10BASE-T are supported for using TCP/IP.

4.3 IPv4 and IPv6 support

Only IPv4 is supported.

5 Configuration

5.1 Verification Service Class SCU

5.1.1 Configurable Parameters

The followings are configurable parameters.

Item	Contents
IP address	IP address of SCP
Port number	Port number of SCP
Calling AE-TITLE	Application title of MX1
Called AE-TITLE	Application title of SCP

5.2 Storage Service Class SCU

5.2.1 Configurable Parameters

The followings are configurable parameters.

Item	Contents
IP address	IP address of SCP
Port number	Port number of SCP
Calling AE-TITLE	Application title of MX1
Called AE-TITLE	Application title of SCP

5.3 Basic Worklist Management Service Class SCU

5.3.1 Configurable Parameters

The followings are configurable parameters.

Item	Contents
IP address	IP address of SCP
Port number	Port number of SCP
Calling AE-TITLE	Application title of MX1
Called AE-TITLE	Application title of SCP

6 Support of Extended Character Sets

The VR provides support for extended characters in SH (short string), LO (long string), ST (short text), LT (long text), and PN (person name) by specifying an extended character repertoire for the Attribute Specific Character Set (0008,0005) in each Service Class.

The supported extended character repertoire is as follows.

- ISO_IR 100
- ISO_IR 192

In addition, The MX1 Media Storage supported extended character repertoire is as follows.

- ISO_IR 192



KONICA MINOLTA

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