TOSHIBA

DICOM CONFORMANCE STATEMENT
MODALITY PERFORMED PROCEDURE STEP SCU
FOR
TOSHIBA WHOLE-BODY X-RAY CT SCANNER
A-SERIES, A-SERIES/MULTI
(COT-33A) (COT-33C)

TOSHIBA CORPORATION

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Table of Contents

1   Introduction

This document is a DICOM Conformance Statement for Toshiba CT scanner A-series. 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 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
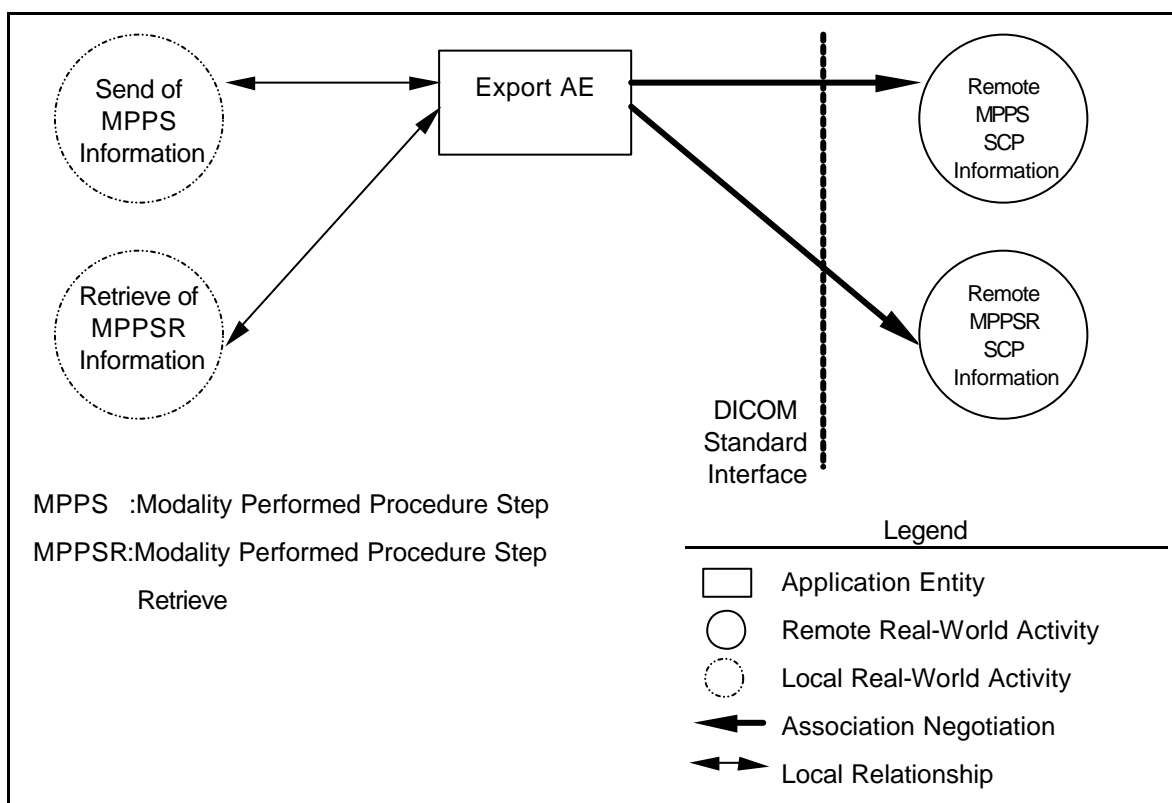
Figure 1

2.2 Functional Definitions of AE's

2.2.1 Export AE

Export AE is used to transmit the MPPS information to a remote DICOM device. It therefore performs the following tasks:

- Builds DICOM MPPS Objects
- Establishes DICOM Association with remote DICOM device
- Performs transmit of DICOM MPPS information Objects to remote DICOM device

Export AE is used to transmit request to retrieving the MPPSR information to a remote DICOM device. It therefore performs the following tasks:

- Establishes DICOM Association with remote DICOM device
- Performs request of DICOM MPPSR Objects to remote DICOM device
- Retrieves DICOM MPPSR Information from remote DICOM device

2.3   Sequencing of Real World Activities

2.3.1   Features

2.3.1.1   Send of MPPS information

- Automatically send the MPPS information when the examination is started.
- Automatically send the MPPS information when the examination is finished or when the study information is deleted.
- Operator requests to send MPPS information after scan finished.

2.3.1.2   Retrieve of MPPSR information

- Automatically request to retrieve MPPSR information.

2.3.2   Operation

2.3.2.1   Send of MPPS information

The operation for manual MPPS information sending is described below:

Step-1: Display study information on Report window.

Step-2: Request transfer.

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
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3
Modality Performed Procedure Step Retrieve	1.2.840.10008.3.1.2.3.4

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 the PDU size of 16 Kbytes only. The default value is set to 16 Kbytes.

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:

- "Send of MPPS Information"
    — MPPS   - Send MPPS Information to a remote DICOM device
- "Retrieve of MPPSR Information"
    — MPPSR   - Retrieve MPPSR Information from a remote DICOM device

3.1.2.1 Export Real-World Activity - MPPS

3.1.2.1.1 Export Associated Real-World Activity - MPPS

MPPS is executed after the operator's MPPS information transfer requests are queued.

3.1.2.1.2 Export Proposed Presentation Contexts - MPPS

Export AE proposes the following Presentation Contexts shown below:

Table 3

Presentation Context Table					
Abstract Syntax		Transfer Syntax			Extended
Name	UID	Name List	UID List	Role	Negotiation
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.1.2.1.3 Export SOP Specific Conformance - MPPS

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

(1) Association establishment (requestor only)

(2) Information data transfer (SCU only)

(3) Association release (requestor only)

Export AE judges that the transfer of one MPPS information succeeded when the result of (2) "Information data transfer" is "Success" even if the result of (3) "Association release" is "Failure".

MPPS Information Object Definition is described in chapter 8.

3.1.2.2　Export Real-World Activity - MPPSR

3.1.2.2.1　Export Associated Real-World Activity - MPPSR

MPPSR is automatically executed.

3.1.2.2.2　Export Proposed Presentation Contexts - MPPSR

Export AE proposes the following Presentation Contexts shown below:

Table 4

Presentation Context Table					
Abstract Syntax		Transfer Syntax			Extended
Name	UID	Name List	UID List	Role	Negotiation
Modality Performed Procedure Step Retrieve	1.2.840.10008.3.1.2.3.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Modality Performed Procedure Step Retrieve	1.2.840.10008.3.1.2.3.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None

3.1.2.2.3　Export SOP Specific Conformance - MPPSR

Export AE operation involves the following sequence of steps for each MPPSR information retrieve.

(1)　Association establishment (requestor only)

(2)　Retrieve MPPSR information (SCU only)

(3)　Association release (requestor only)

Export AE judges that the retrieve of one MPPSR information succeeded when the result of "Retrieve MPPSR information" is "Success" even if the result of (3) "Association release" is "Failure".

MPPSR Information Object Definition is described in chapter 9.

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 A-series, the configuration can be set through interaction.

Note: Settings and changes are performed by Toshiba Service Personnel at a time of installation of the A-series .

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.

SCU   SCP

Association

TCP connection

Initiation of connection

Association establishment request   S1

Association establishment response

S2

Service request   S3

Service response

S4

Association release request   S3

Association release response

S5

Disconnection
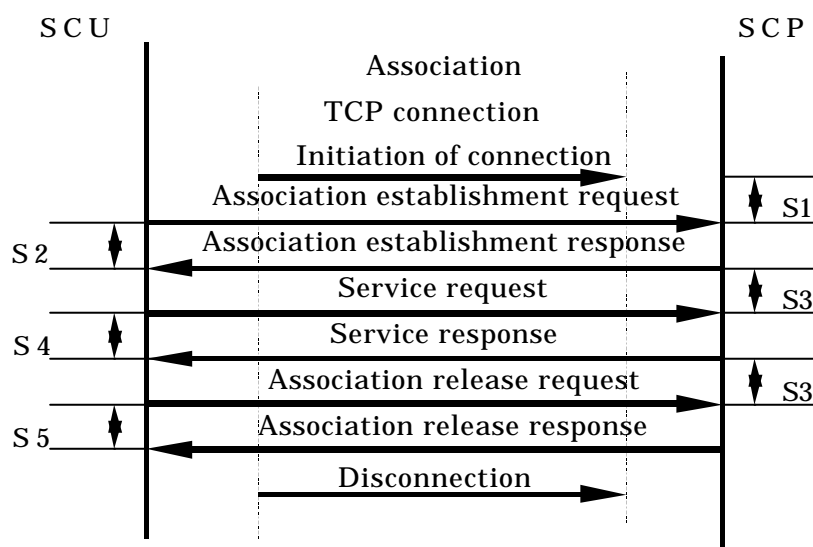
Figure 2

Table 5

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 the A-series.
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 A-series.
S3	Service request waiting time	Not set	Not set	Not set	Not applicable to the A-series.
S4	Service response waiting time	default: 180 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set in the A-series.
S5	Association release waiting time	default: 5 seconds range: 1 to 999999	Not set	Not set	Only one parameter can be set in the A-series.

◆ Performed value may be different from the setting value, because of the condition of the communication line of the burden of the environment of the A-series.

6.3   Implementation Information and Maximum Reception PDU Size

The default values for the A-series are used for the Implementation Class UID, the Implementation Version name, and the Maximum length received.

Table 6

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(unit:byte)	16 Kbytes

6.4   Default Transfer Syntax

● Send of MPPS Information

When two transfer syntax responses are received, A-series performs the transfer using the following setting:

Default = "Implicit VR Little Endian"

● Retrieve of MPPSR Information

When two transfer syntax responses are received, A-series performs the transfer using the following setting:

Default = "Implicit VR Little Endian"

7 Support of Extended Character Sets

This product supports the following character sets:

- ISO-IR 6 (default)   Basic G0 Set

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

8 DIMSE-Service and Attributes - MPPS

8.1 DIMSE-Services

Table 7

SOP Class	DIMSE Service Element	Usage SCU [*1]	Usage
Modality Performed Procedure Step SOP Class	N-CREATE	M	used
	N-SET	M	used

*1 : M = Mandatory

8.2 Modality Performed Procedure Step SOP Class

The attributes listed in the following tables represent a small set of the possible attributes which could be supported by a Modality Performed Procedure Step SCU.

8.2.1 N-CREATE Attributes

Table 8

Attribute Name	Tag	Requirement Type	Attribute Description
Specific Character Set	(0008,0005)	1C	Always set when an expanded or replacement character set is used.
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	Always set
>Study Instance UID	(0020,000D)	1	Always set
>Referenced Study Sequence	(0008,1110)	2	Length=0 when no entry is made
>> Referenced SOP Class UID	(0008,1150)	1C	Not set when no data is available
>> Referenced Instance UID	(0008,1155)	1C	Not set when no data is available
>Accession Number	(0008,0050)	2	Length=0 when no entry is made
>Placer Order Number/Imaging Service Request	(0040,2016)	3	Not set when no data is available
>Filler Order Number/Imaging Service Request	(0040,2017)	3	Not set when no data is available
>Requested Procedure ID	(0040,1001)	2	Length=0 when no entry is made
>Filler Order Number/Procedure	(0040,1007)	3	Not set when no data is available
>Scheduled Procedure Step ID	(0040,0009)	2	Length=0 when no entry is made
>Scheduled Procedure Step Description	(0040,0007)	2	Length=0 when no entry is made

>Scheduled Action Item Code Sequence	(0040,0008)	2	Length=0 when no entry is made
>>Code Value	(0008,0100)	1C	Not set when no entry is made
>>Coding Scheme designator	(0008,0102)	1C	Not set when no entry is made
>>Coding Scheme Version	(0008,0103)	3	Not set when no entry is made
>>Code Meaning	(0008,0104)	3	Not set when no entry is made
Patient's Name	(0010,0010)	2	Length=0 when no entry is made
Patient ID	(0010,0020)	2	Length=0 when no entry is made
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
Referenced Patient Sequence	(0008,1120)	2	Length=0 when no entry is made
>Referenced SOP Class UID	(0008,1150)	1C	Not set when no entry is made
>Referenced Instance UID	(0008,1155)	1C	Not set when no entry is made
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	Always set
Performed Station AE Title	(0040,0241)	1	Always set
Performed Station Name	(0040,0242)	2	Length=0 when no entry is made
Performed Location	(0040,0243)	2	Length=0 when no entry is made
Performed Procedure Step Start Date	(0040,0244)	1	Always set
Performed Procedure Step Start Time	(0040,0245)	1	Always set
Performed Procedure Step Status	(0040,0252)	1	Always set
Performed Procedure Step Description	(0040,0254)	2	Length=0 when no entry is made
Performed Procedure Type Description	(0040,0255)	2	Length=0 when no entry is made
Procedure Code Sequence	(0008,1032)	2	Length=0 when no entry is made
>Code Value	(0008,0100)	1C	Not set when no entry is made
>Coding Scheme designator	(0008,0102)	1C	Not set when no entry is made

>Coding Scheme Version	(0008,0103)	3	Not set when no entry is made
>Code Meaning	(0008,0104)	3	Not set when no entry is made
Performed Procedure Step End Date	(0040,0250)	2	Length=0 when no entry is made
Performed Procedure Step End Time	(0040,0251)	2	Length=0 when no entry is made
Image Acquisition Results			
Modality	(0008,0060)	1	Always set("CT")
Study ID	(0020,0010)	2	Always set
Performed Action Item Code Sequence	(0040,0260)	2	Length=0 when no entry is made
>Code Value	(0008,0100)	1C	Not set when no entry is made
>Coding Scheme designator	(0008,0102)	1C	Not set when no entry is made
>Coding Scheme Version	(0008,0103)	3	Not set when no entry is made
>Code Meaning	(0008,0104)	3	Not set when no entry is made
Performed Series Sequence	(0040,0340)	2	Length=0 when no entry is made
>Performing Physician's Name	(0008,1050)	2C	Not set when no entry is made
>Protocol Name	(0018,1030)	1C	Not set when no entry is made
>Operator's Name	(0008,1070)	2C	Not set when no entry is made
>Series Instance UID	(0020,000E)	1C	Not set when no entry is made
>Series Description	(0008,103E)	2C	Not set when no entry is made
>Retrieve AE Title	(0008,0054)	2C	Not set when no entry is made
>Referenced Image Sequence	(0008,1140)	2C	Not set when no entry is made
>>Referenced SOP Class UID	(0008,1150)	1C	Not set when no entry is made
>>Referenced SOP Instance UID	(0008,1155)	1C	Not set when no entry is made
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	Not set when no entry is made

>>Referenced SOP Class UID	(0008,1150)	1C	Not set when no entry is made
>>Referenced SOP Instance UID	(0008,1155)	1C	Not set when no entry is made

Radiation Dose			
Total Time of Fluoroscopy	(0040,0300)	3	Not set when no data is available
Total Number of Exposures	(0040,0301)	3	Not set when no data is available
Comments on Radiation Dose	(0040,0310)	3	Not set when no entry is made

Billing and Material Code			
Film Consumption Sequence	(0040,0321)	3	Not set when no data is available
>Number of Films	(2100,0170)	3	Not set when no data is available
>Medium Type	(2000,0030)	3	Not set when no data is available
>Film Size ID	(2010,0050)	3	Not set when no data is available
Billing Supplies and Devices Sequence	(0040,0324)	3	Not set when no data is available
>Quantity Sequence	(0040,0293)	3	Not set when no data is available
>>Quantity	(0040,0294)	3	Not set when no data is available
>>Measuring Units Sequence	(0040,0295)	3	Not set when no data is available
>>>Code Value	(0008,0100)	3	Not set when no data is available
>>>Coding Scheme Designator	(0008,0102)	3	Not set when no data is available
>>>Coding Scheme Version	(0008,0103)	3	Not set when no data is available
>>>Code Meaning	(0008,0104)	3	Not set when no data is available

8.2.2   N-SET Attributes

Table 9

Attribute Name	Tag	Requirement Type(*1)	Attribute Description
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	Not set when no entry is made
Performed Procedure Step Description	(0040,0254)	3	Not set when no entry is made
Performed Procedure Type Description	(0040,0255)	3	Not set when no entry is made
Procedure Code Sequence	(0008,1032)	3	Not set when no entry is made
>Code Value	(0008,0100)	1C	Not set when no entry is made
>Coding Scheme designator	(0008,0102)	1C	Not set when no entry is made
>Coding Scheme Version	(0008,0103)	3	Not set when no entry is made
>Code Meaning	(0008,0104)	3	Not set when no entry is made
Performed Procedure Step End Date	(0040,0250)	3(1)	Not set when no entry is made
Performed Procedure Step End Time	(0040,0251)	3(1)	Not set when no entry is made
Image Acquisition Results			
Performed Action Item Code Sequence	(0040,0260)	3	Not set when no entry is made
>Code Value	(0008,0100)	1C	Not set when no entry is made
>Coding Scheme designator	(0008,0102)	1C	Not set when no entry is made
>Coding Scheme Version	(0008,0103)	3	Not set when no entry is made
>Code Meaning	(0008,0104)	3	Not set when no entry is made
Performed Series Sequence	(0040,0340)	3(1)	Not set when no entry is made
>Performing Physician's Name	(0008,1050)	2C(2)	Not set when no entry is made
>Protocol Name	(0018,1030)	1C(1)	Not set when no entry is made
>Operator's Name	(0008,1070)	2C(2)	Not set when no entry is made

>Series Instance UID	(0020,000E)	1C(1)	Not set when no entry is made
>Series Description	(0008,103E)	2C(2)	Not set when no entry is made
>Retrieve AE Title	(0008,0054)	2C(2)	Not set when no entry is made
>Referenced Image Sequence	(0008,1140)	2C	Not set when no entry is made
>>Referenced SOP Class UID	(0008,1150)	1C	Not set when no entry is made
>>Referenced SOP Instance UID	(0008,1155)	1C	Not set when no entry is made
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	Not set when no entry is made
>>Referenced SOP Class UID	(0008,1150)	1C	Not set when no entry is made
>>Referenced SOP Instance UID	(0008,1155)	1C	Not set when no entry is made
Radiation Dose			
Total Time of Fluoroscopy	(0040,0300)	3	Not set when no data is available
Total Number of Exposures	(0040,0301)	3	Not set when no data is available
Comments on Radiation Dose	(0040,0310)	3	Not set when no entry is made
Billing and Material Code			
Film Consumption Sequence	(0040,0321)	3	Not set when no data is available
>Number of Films	(2100,0170)	3	Not set when no data is available
>Medium Type	(2000,0030)	3	Not set when no data is available
>Film Size ID	(2010,0050)	3	Not set when no data is available
Billing Supplies and Devices Sequence	(0040,0324)	3	Not set when no data is available
>Quantity Sequence	(0040,0293)	3	Not set when no data is available
>>Quantity	(0040,0294)	3	Not set when no data is available
>>Measuring Units Sequence	(0040,0295)	3	Not set when no data is available
>>>Code Value	(0008,0100)	3	Not set when no data is available

>>>Coding Scheme Designator	(0008,0102)	3	Not set when no data is available
>>>Coding Scheme Version	(0008,0103)	3	Not set when no data is available
>>>Code Meaning	(0008,0104)	3	Not set when no data is available

(*1) Requirement Type Final State

9 DIMSE-Service and Attributes - MPPSR

9.1 DIMSE-Services

Table 10

SOP Class	DIMSE Service Element	Usage SCU [*1]	Usage
Modality Performed Procedure Step Retrieve SOP Class	N-GET	M	used

*1 : M = Mandatory

9.2 Modality Performed Procedure Step Retrieve SOP Class

The attributes listed in the following tables represent a small set of the possible attributes which could be supported by a Modality Performed Procedure Step Retrieve SCU.

9.2.1 N-GET Attributes

Table 11

Attribute Name	Tag	Requirement Type	Attribute Description
Performed Procedure Step Information			
Performed Procedure Step Description	(0040,0254)	3	
Performed Procedure Type Description	(0040,0255)	3	
Radiation Dose			
Comments on Radiation Dose	(0040,0310)	3	