DICOM Conformance Statement

Cardiac Workstation 5000/7000 R1.1

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1. Overview

The Cardiac Workstation 5000/7000 implements the necessary DICOM services to:

(1) Search and retrieve worklists (lists of orders) from information systems,

(2) Start acquisition of Worklist item, acquire images, and complete acquisition and finalize MPPS,

(3) Save ECG waveform objects to network storage system &

(4) Commit objects to storage systems.

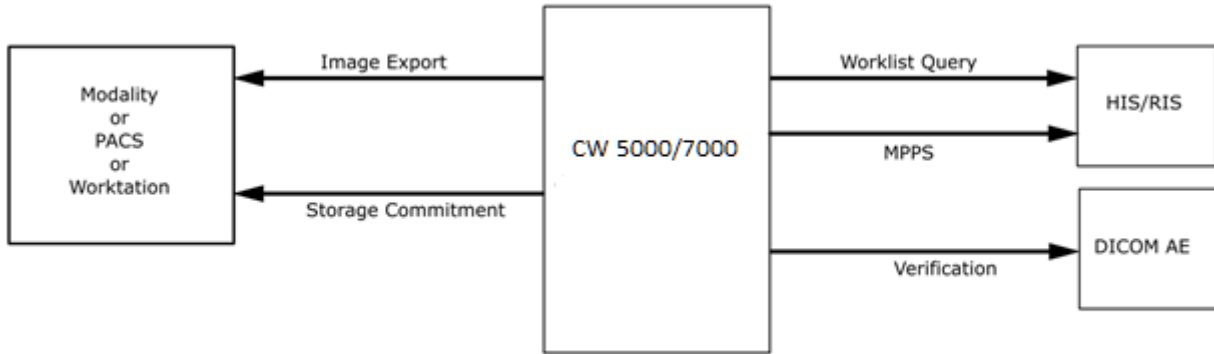Below figure depicts DICOM service implemented by Cardiac Workstation 5000/7000.

Figure 1-1: Overview of Implemented Services

1.1. Content and Transfer

Table 1-1 lists all Storage SOP Classes and the supported transfer mechanisms as well as the usage scenarios for those instances.

The "Transfer Syntax Set" column lists the sets of Transfer Syntaxes defined in Table 1-2 that are applicable to each SOP Class. The "DIMSE", "DICOM Web" and "Media Services" columns indicate the roles supported for each SOP Class.

The "Function" columns indicate how the instances are used by the system:

- Create: The system creates instances of the SOP Class. The type of the created SOP Class is indicated by one of the following abbreviations:
  - o S: Standard SOP Class
  - o SE: Standard Extended SOP Class
  - o SP: Specialized SOP Class
  - o P: Private SOP Class
- Display: The system displays the instances of the SOP Class to the user, either by displaying the SOP Instances natively or by applying instances of another suitable SOP Class to the image instances (e.g., a Presentation State or CAD SR).
- Process: The system processes the instances of the SOP Class to derive some further information that is made available to the user (e.g., a CAD processing algorithm, or a 3D Rendering).
- Archive: The system stores the instances of the SOP Class and makes them available again.

Table 1-1: Storage SOP Classes

SOP Classes		Transfer Syntax Set	DIMSE Services		DICOM Web Services		Media Services			Function			
			SCU	SCP	UA	OS	FSC	FSU	FSR	Create	Display	Process	Archive
12-Lead ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.1	NI	Yes	No	N/A	N/A	N/A	N/A	N/A	S	N/A	N/A	N/A
General ECG Waveform Storage SOP Class	1.2.840.10008.5.1.4.1.1.9.1.2	NI	Yes	No	N/A	N/A	N/A	N/A	N/A	S	N/A	N/A	N/A
Encapsulated PDF Storage SOP Class	1.2.840.10008.5.1.4.1.1.104.1	NI	Yes	No	N/A	N/A	N/A	N/A	N/A	S	N/A	N/A	N/A

Table 1-2: Supported Transfer Syntaxes

Transfer Syntax Set	Transfer Syntax Name	Transfer Syntax UID	DICOM Web Service Bulkdata Media Type
Non-Image Transfer Syntax Set (NI)	Implicit VR Little Endian	1.2.840.10008.1.2	N/A
	Explicit VR Little Endian native	1.2.840.10008.1.2.1	N/A

1.1.1. Structured Reporting Root Template IDs – N/A

Not Applicable

1.2. DIMSE Services

1.2.1. Verification

Table 1-3 lists support for the Verification SOP Class.

Table 1-3: Verification SOP Class

SOP Classes		Transfer Syntax		SCU	SCP
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No

1.2.2. Storage

For details on supported Storage SOP Classes see Section 1.1.

1.2.3. Workflow Management

Table 1-4 lists all supported Workflow Management SOP Classes.

Table 1-4: Workflow Management SOP Classes

SOP Classes		Transfer Syntax		SCU	SCP
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	Yes	No
		Explicit VR Little Endian	1.2.840.10008.1.2.1	Yes	No

1.2.4. Query/Retrieve – N/A

Not Applicable.

1.2.5. Printing – N/A

Not applicable.

1.3. DICOM Web Services – N/A

Not Applicable.

1.4. Media Services – N/A

Not Applicable.

1.5. Real Time Video Service – N/A

Not Applicable.

1.6. De-identification Profiles – N/A

Not Applicable.

1.7. Specific Character Sets

Table 1-5: Supported Specific Character Sets

Defined Term	IANA	Description
Single-Byte Character Sets without Code Extensions		
ISO_IR 6	ISO-646	Default Repertoire
ISO_IR 100	ISO-8859-1	Latin Alphabet No.1 (West Europe)

2. Table of Contents

3. Introduction

The introduction specifies product and relevant disclaimers as well as any general information that the vendor feels is appropriate.

3.1. Revision History

The revision history provides dates and differences of the different releases.

Table 3-1: Revision History

Revision	Date	Product Version(s)	Change
01	04-Apr-2025	1.1	First release of Cardiac Workstation 5000/7000

3.2. Audience

This document is intended for the audience listed below. It is assumed that the reader has a working knowledge of the DICOM Standard.

The document structure was designed for easier access to relevant information for different user groups:

- Clinical Users, who want to get an overview of the implemented interoperability features of the system can see Section 4 Implementation Model.
- Personnel involved in Sales can use the information in Section 1 to assess the compatibility between different systems involved in a sales situation.
- System Integrators can use information in Section 6 during system installation and also information from Section 5 Service and Interoperability Description for details regarding the implemented services.
- Field Service Engineers can use the details from Section 5 Service and Interoperability Description and from Section 7 Network and Media Communication Details for troubleshooting.
- Hospital IT staff focusing on security can use the details provided in Section 8 Security regarding implemented Security features.
- Research Personnel may be interested in using information provided in Annex A Information Object Definitions (IODs) or Annex B Structured Report Content Encoding to get detailed imaging and measurement information.

3.3. Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between Cardiac Workstation 5000/7000 and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1]. DICOM by itself does not guarantee interoperability.

- The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.
- This Conformance Statement should not replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, it is the user's responsibility to perform the following validation activities:
  - The comparison of Conformance Statements from Cardiac Workstation 5000/7000 and other DICOM conformant equipment is the first step towards assessing interconnectivity and interoperability between those systems.
  - Test procedures should be defined and executed to validate the required level of interoperability with specific DICOM conformant equipment, as established by the healthcare facility.

3.4. Terms and Definitions

The following list includes DICOM Terms, that are used throughout this Conformance Statement:

PHILIPS

Table 3-2: Terms and Definitions

Abstract Syntax	The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.
Application Entity (AE)	A representation of the external behavior of an application process in terms of DICOM Network Services, Web Services and/or media exchange capabilities implemented in one or more roles. A single device may have multiple Application Entities.
Application Entity Title (AET)	The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.
Application Context	The specification of the type of communication used between Application Entities. Example: DICOM network protocol.
Association	A network communication channel set up between Application Entities.
ANSI	American National Standard Institute
Attribute	A unit of information in an Information Object Definition; a Data Element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower-level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Data Element	A unit of information as defined by a single entry in the data dictionary. An encoded Information Object Definition (IOD) Attribute that is composed of, at a minimum, three fields: a Data Element Tag, a Value Length, and a Value Field. For some specific Transfer Syntaxes, a Data Element also contains a VR Field where the Value Representation of that Data Element is specified explicitly
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object does not represent a specific instance of the data object, but rather a Class of similar data objects that have the same properties. Examples: MR Image IOD, CT Image IOD, Print Job IOD. The Attributes within an IOD may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C).
Media Application Profile	The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs).
Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient's Name, Patient ID, Patient' Birth Date, and Patient's Sex.
Negotiation	First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.
NEMA	National Electrical Manufacturers Association
Origin Server	Refers to the program that can originate authoritative responses to HTTP requests for a given Target Resource. The term "server" refers to any implementation that receives a web service request message from a user agent.
Presentation Context	The set of DICOM Network Services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.
Private SOP Class	A SOP Class that is not defined in the DICOM Standard but is published in an implementation's Conformance Statement.

Protocol Data Unit (PDU)	A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.
Security Profile	A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.
Service Class Provider (SCP)	Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).
Service Class User (SCU)	Role of an Application Entity that uses a DICOM Network Service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).
Service/Object Pair Class (SOP Class)	The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of a DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair Instance (SOP Instance)	An information object: a specific occurrence of information exchanged in a SOP Class. E.g., a specific X-ray image.
Specialized SOP Class	A SOP Class that is derived from the Standard that is specialized by additional type 1, 1C, 2, 2C, or 3 Attributes, by enumeration of specific permitted Values for Attributes, or by enumeration of specific permitted Templates. The additional Attributes may either be drawn from the Data Dictionary in PS3.6 or may be Private Attributes.
Standard SOP Class	A SOP Class defined in the Standard, and that is implemented and used without any modifications.
Standard Extended SOP Class	A SOP Class that is defined in the standard, and that is extended by additional type 3 Attributes. The additional Attributes may either be drawn from the DICOM Data Dictionary in PS3.6 or may be Private Attributes.
Tag	A 32-bit identifier for a Data Element, represented as a pair of four-digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].
Transfer Syntax	The encoding is used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), Little Endian Explicit Value Representation.
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS-Secured Port	TCP port on which an implementation accepts TLS connections to exchange DICOM information.
Unique Identifier (UID)	A globally unique "dotted decimal" string that identifies a specific object or a Class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
User Agent	A client in a network protocol used in communications within a client-server distributed computing system. In particular, the Hypertext Transfer Protocol (HTTP) identifies the client software originating the request, using a user-agent header, even when the client is not operated by a user.

Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.5. Abbreviations

Abbreviations that are used in this DICOM Conformance Statement are listed here.

Table 3-3: Abbreviations

AE	Application Entity
AET	Application Entity Title
ANSI	American National Standard Institute
AP	Application profile
CAD	Computer Aided Detection
CDA	Clinical Document Architecture
CID	Context Identifier
CW	Cardiac Workstation
DCS	DICOM Conformance Statement
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DIMSE-C	DIMSE-Composite
DIMSE-N	DIMSE-Normalized
EBE	DICOM Explicit VR Big Endian
ECG	Electrocardiogram
ELE	Explicit VR Little Endian
FSC	File-Set Creator
FSR	File-Set Reader
FSU	File-Set Updater
IANA	Internet Assigned Numbers Authority
IHE	Integrating the Healthcare Enterprise
ILE	Implicit VR Little Endian
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISIS	Information System - Imaging System
ISO	International Organization for Standardization
MOD	Magneto-Optical Disk
MPPS	Modality Performed Procedure Step
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association

NTP	Network Time Protocol
OID	Object Identifier
OS	Origin Server
PDU	Protocol Data Unit
PHI	Protected Health Information
PPS	Performed Procedure Step
QIDO-RS	Query based on ID for DICOM Objects by RESTful Services
RTV	Real Time Video
RWA	Real World Activity
SCP	Service Class Provider
SCU	Service Class User
SDP	Service Description Protocol
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Reporting
STOW-RS	Store Over the Web by RESTful Services
TCP/IP	Transmission Control Protocol/Internet Protocol
TID	Template Identifier
UA	User Agent
UI	User Interface
UID	Unique Identifier
UL	Upper Layer
UPS	Unified Procedure Step
UPS-RS	Unified Procedure Step by RESTful Services
VR	Value Representation
WADO-RS	Web Access to DICOM Objects by RESTful Services
WADO-URI	Web Access to DICOM Objects by URI
WLM	Worklist Management

3.6. References

[1] National Electrical Manufacturers Association (NEMA), Rosslyn, VA USA. *PS3 / ISO 12052 Digital Imaging and Communications in Medicine (DICOM) Standard*. http://www.dicomstandard.org.

4. Implementation Model

The implementation model consists of three sections:

- The application data flow diagram, specifying the relationship between the Application Entities and the "external world" or Real-World Activities,
- A functional description of each Application Entity.

4.1. Application Entities and Data Flow

The network and media interchange application model for the Cardiac Workstation 5000/7000 is shown in Figure 4-1 Cardiac Workstation 5000/7000 Application Data Flow Diagram.

The operator of a Cardiac Workstation 5000/7000electrocardiograph initiates a Modality Worklist query when an up-to-date list is needed. This, in turn, causes a Modality Worklist query to the configured Modality Worklist SCP.

One Work item is then selected from the Modality Worklist and the acquisition is started thus creating MPPS. After acquiring the images, acquisition is completed and MPPS is finalized.

When one or more ECGs have been acquired, the operator of a Cardiac Workstation 5000/7000 electrocardiograph initiates a single or batch ECG transmission. This, in turn, causes one or more 12-lead or General ECG Waveform objects or Encapsulated PDF Storage objects to be stored into the configured Storage SCP. If the Storage SCP is configured as an archive device the Cardiac Workstation 5000/7000 will request Storage Commitment and if a commitment is successfully obtained will record this information in local database.
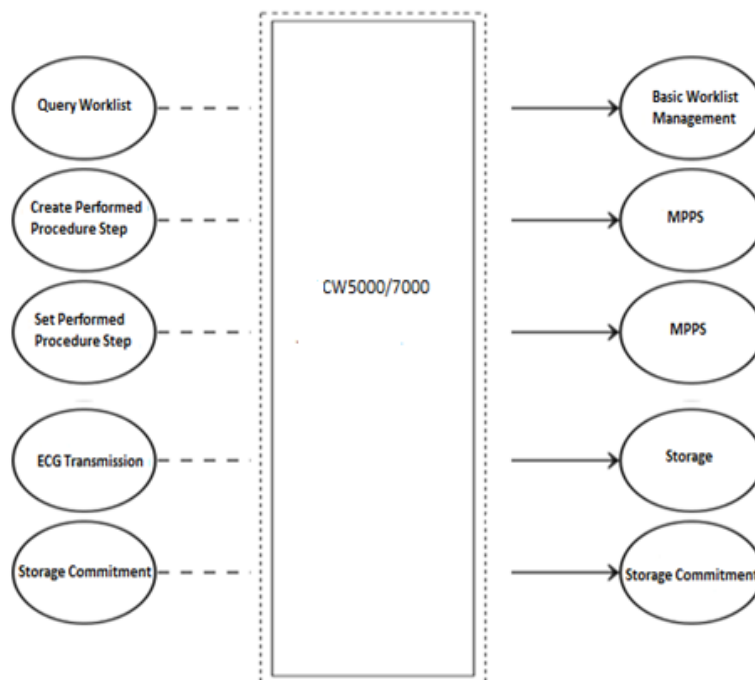
Figure 4-1: Cardiac Workstation 5000/7000 Application Data Flow Diagram

This section describes the organization of the supported Services into Application Entities based on the default configuration of the system. This may change based on the actual setup at the customer site. See Section 6 for details about the configurability of Services into AEs.

PHILIPS

4.1.1. Functional Definition of ECG Storage Application Entity

After acquiring one or more ECGs, the operator can initiate a single or batch transmission of ECGs. This causes the Cardiac Workstation 5000/7000 cardiograph to store each ECG into the configured storage SCP. Each ECG is stored as a 12-lead or General ECG Waveform object or Encapsulated PDF Storage Object.

4.1.2. Functional Definition of Worklist Application Entity

The operator of a Cardiac Workstation 5000/7000 cardiograph can choose to retrieve an up-to-date worklist to the cardiograph.
The operator can either initiate this function on the Worklist GUI to retrieve the whole list, or specify query filters on the Find Patient GUI, and the Modality Worklist service provider is queried for the Modality Worklist. The returned list of work items is listed on the cardiograph. One Work item is then selected from the Modality Worklist and the acquisition is started thus creating MPPS. After acquiring the images, acquisition is completed and MPPS is finalized.

5. Service and Interoperability Description

5.1. Mapping of Services to Application Entities

Table 5-1 provides an overview of the Application Entities and the Services supported by each AE.

Table 5-1: Service to AE Mapping

Application Entity	Supported Services	Role								
		DIMSE		DICOM Web		DICOM Media			Real-Time Video	
		SCU	SCP	Origin Server	User Agent	FSC	FSU	FSR	SCU	SCP
ECG Storage AE	Storage	Yes	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Storage Commitment	Yes	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worklist AE	Basic Worklist Management	Yes	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Modality Performed Procedure Step	Yes	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

5.2. Supported DIMSE Services

5.2.1. Basic Worklist Management Service

5.2.1.1. SCU of the Modality Worklist Information Model - FIND SOP Class

The figure below shows sequencing of RWA for MWL as SCU.
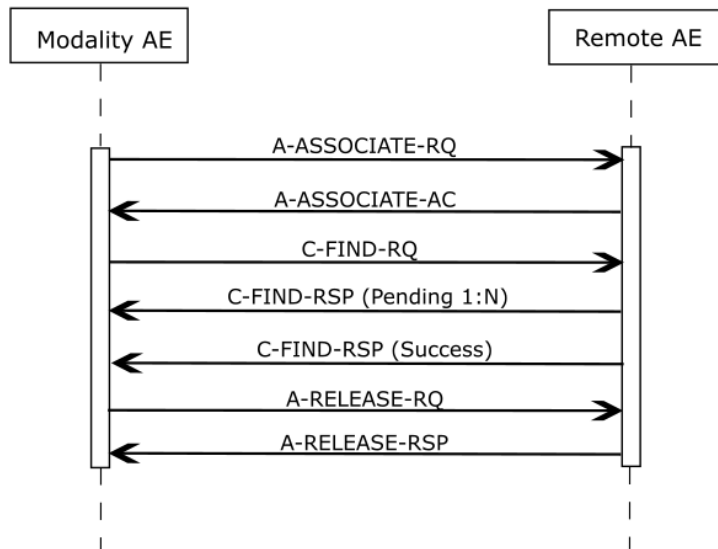
Figure 5-1: Real World Activity – Modality Worklist as SCU

As a Service Class User of the Modality Worklist Information Model - FIND SOP Class, the Cardiac Workstation 5000/7000 uses the C-FIND-RQ message to query the SCP. It supports the Query Keys listed in Table 5-2.

➢ On receiving empty values for mandatory attributes in response no failure & warning message is displayed in the UI
➢ When MWL Query is performed from the system with few mandatory keys do not present in the MWL C-FIND-RQ then CW 5000/7000 system responded with all the mandatory attributes with Empty values in the MWL C-FIND-RSP.
➢ When responses with empty values for mandatory attributes are received specifically empty values for patient id & patient name, no error is displayed on selecting the study. For an Unscheduled patient, the system shall be able to perform the procedure and send MPPS messages.
➢ When Mandatory return key violation is sent in response, CW 5000/7000 system continued querying for further studies without any error.
➢ When an order is received from a different AE title, CW 5000/7000 system is able to perform the acquisition and proceed with the remaining workflows.
➢ CW 5000/7000 system does not combine multiple schedule procedures into one entry and that all scheduled procedures are available separately in the worklist responses.
➢ For an Unscheduled patient, the system shall be able to perform the procedure and send MPPS messages.
➢ When CW 5000/7000 system Receives the C-FIND-RSP for the MWL Query with additional attributes which are not requested by system, the system receives all the attributes and system is in the stable state without any issues after the test is executed.
➢ While trying to perform the procedure which matches the CW 5000/7000 system but not the system's scheduled station AE, the system receives the order from different AE title and performs the acquisition and proceeds with the remaining workflows.

In the "Matching Type" column, the following Values can be used:

- SINGLE_VALUE: SCU can request single Value matching on this Attribute.
- UID: SCU can request List of UID matching on this Attribute.
- WILDCARD: SCU can request Wildcard matching on this Attribute.
- RANGE: SCU can request Range matching on this Attribute.
- SEQUENCE: SCU can request sequence matching on this Attribute.
- UNIVERSAL: SCU can request that the Attribute be a return Value (universal matching).

PHILIPS

In the "Query Value Source" column, the following Values can be used:

- FIXED: The query Value cannot be modified by the user or by configuration.
- GENERATED: The query Value is generated by the system (e.g., current date as the study date).
- CONFIGURATION: The query Value is dependent on system configuration.
- USER: The query Value is entered by the user.
- SCANNED: The query Value is read from a barcode scanner or similar device.
- EMPTY: The query Value is sent with a zero-length Value to indicate it is a return key only.

In the "Display on UI" column the following Values can be used:

- D: the return Value is displayed on the main UI by default.
- C: the return Value is displayed on the main UI if configured.
- N: the return Value is never displayed.

Note: Return keys are documented in "Display on UI" as N and D

Table 5-2: Supported C-FIND Query Parameters for Modality Worklist - SCU

Attribute Name	Tag	Matching Type	Query Value Source	Value	Display on UI	Comments
			Scheduled Procedure Step			
Scheduled Procedure Step Sequence	0040,0100	Universal	GENERATED		D	
>Modality	0008,0060	Single	USER	ECG	D	
>Scheduled Station AE Title	0040,0001	Universal	USER		D	
>Scheduled Procedure Step Start Date	0040,0002	Range, Universal	USER		D	Order Request" is displayed on UI.
>Scheduled Procedure Step Start Time	0040,0003	Universal	USER		D	Order Request" is displayed on UI.
>Scheduled Procedure Step Description	0040,0007	Universal	EMPTY		N	
>Scheduled Protocol Code Sequence	0040,0008	Universal	GENERATED		N	Returned in C-FIND response.
>>Code Value	0008,0100	Universal	EMPTY		N	
>>Coding Scheme Designator	0008,0102	Universal	EMPTY		N	
>>Code Meaning	0008,0104	Universal	EMPTY		N	
>Scheduled Procedure Step ID	0040,0009	Universal	USER		D	AE title of the system performing the query
>Scheduled Station Name	0040,0010	Universal	USER		D	Current date and time minus 1 hour plus 24 hours ahead
>Scheduled Procedure Step Location	0040,0011	Universal	USER		D	Current date and time minus 1 hour plus 24 hours ahead

PHILIPS

Attribute Name	Tag	Matching Type	Query Value Source	Value	Display on UI	Comments
>Scheduled Performing Physician's Name	0040,0006	Universal	EMPTY		N	
>Scheduled Procedure Step Status	0040,0020	Universal	EMPTY		N	
Requested Procedure						
Study Instance UID	0020,000D	Universal	EMPTY		N	
Referenced Study Sequence	0008,1110	Universal	GENERATED		N	Returned in C-FIND response.
>Referenced SOP Class UID	0008,1150	Universal	EMPTY		N	
>Referenced SOP Instance UID	0008,1155	Universal	EMPTY		N	
Requested Procedure Description	0032,1060	Universal	EMPTY		N	
Requested Procedure Code Sequence	0032,1064	Universal	GENERATED		N	Returned in C-FIND response.
>>Code Value	0008,0100	Universal	EMPTY		N	
>>Coding Scheme Version	0008,0103	Universal	EMPTY		N	
>> Coding Scheme Designator	0008,0102	Universal	EMPTY		N	
>>Code Meaning	0008,0104	Universal	EMPTY		N	
Requested Procedure ID	0040,1001	Universal	USER		D	
Requested Procedure Priority	0040,1003	Universal	USER		D	
Requested Procedure Location	0040,1005	Universal	USER		D	
Reason for the Requested Procedure	0040,1002	Universal	USER		D	
Imaging Service Request						
Accession Number	0008,0050	Universal	USER		D	"Order number" display in UI
Referring Physician's Name	0008,0090	Universal	USER		D	
Requesting Physician	0032,1032	Universal	EMPTY		N	
Visit Identification						
Institution Name	0008,0080	Universal	USER		D	

PHILIPS

Attribute Name	Tag	Matching Type	Query Value Source	Value	Display on UI	Comments
Admission ID	0038,0010	Universal	USER		D	
Visit Status						
Current Patient Location	0038,0300	Universal	USER		D	
Patient Institution Residence	0038,0400	Universal	EMPTY		N	
Visit Comments	0038,4000		EMPTY		D	
Patient Identification						
Patient's Name	0010,0010	Universal	USER		D	Values>64 characters are accepted by the system and these are copied into created DICOM IODs.
Patient ID	0010,0020	Single	USER		D	
Other Patient IDs	0010,1000	Universal	USER		D	
Patient Demographics						
Patients Birth Date	0010,0030	Universal	USER		D	Date of birth of the named patient
Patient's Sex	0010,0040	Universal	USER		D	Sex of the named patient. Enumerated Values: M = male F = female O = other
Patient Size	0010,1020	Universal	EMPTY		D	Patient's height or length in meters
Patient's Weight	0010,1030	Universal	EMPTY		D	Weight of the patient in kilograms
Ethnic Group	0010,2160	Universal	EMPTY		D	
Patient Medical						
Medical Alerts	0010,2000	Universal	Up		D	

5.2.1.2. SCP of the Modality Worklist Information Model - FIND SOP Class – N/A

Not Applicable.

5.2.2. Modality Performed Procedure Step Service

5.2.2.1. SCU of the Modality Performed Procedure Step SOP Class

The figure below shows sequencing of RWA for MPPS as SCU.
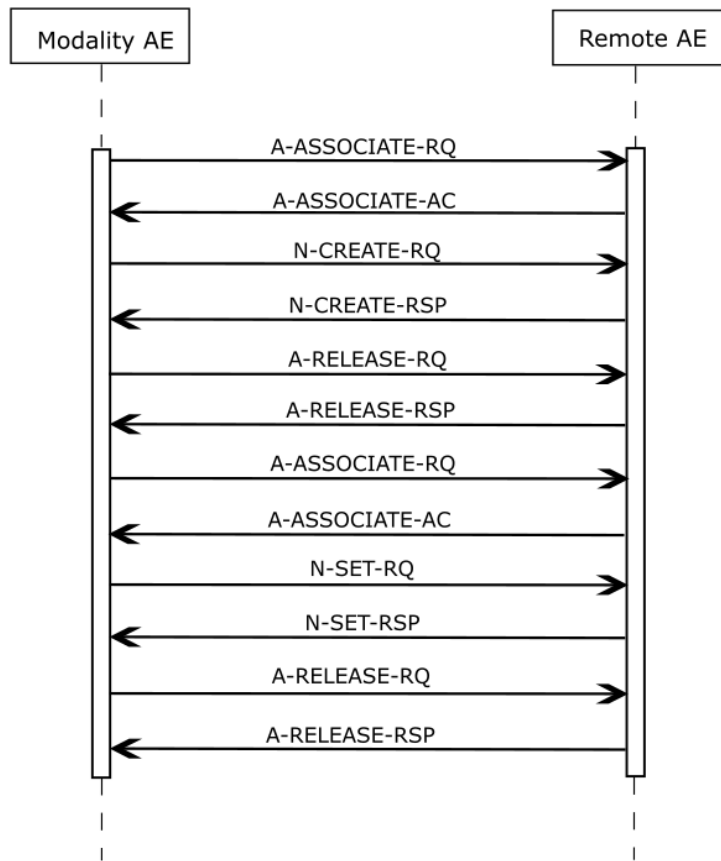
Figure 5-2: Real World Activity – Modality Performed Procedure Step as SCU

As a Service Class User of the Modality Performed Procedure Step SOP Class, the Cardiac Workstation 5000/7000 supports the Attributes listed in Table 5-3 in the N-CREATE-RQ and N-SET-RQ messages, if it creates the message.

In the "Source" column the following Values can be used:

- FIXED: The Value is pre-defined and cannot be modified.
- GENERATED: The Value is generated by the system.
- CONFIGURATION: The Value is copied from system configuration.
- MWL: The Value is copied from modality worklist entry.
- USER: The Value is entered by the user.
- SCANNED: The Value is read from a barcode scanner or similar device.
- EMPTY: The Attribute is sent with a zero-length Value

Table 5-3: Supported N-CREATE and N-SET Attributes for Modality Performed Procedure Step - SCU

Attribute Name	Tag	Source	Value N-CREATE	Value N-SET	Comments
Specific Character Set	0008,0005	CONFIGURATION			
Performed Procedure Step Relationship					
Patient ID	0010,0020	MWL/USER			
Patient's Birth Date	0010,0030	MWL/USER			
Patient's Name	0010,0010	MWL/USER			
Patient's Sex	0010,0040	MWL/USER			

Attribute Name	Tag	Source	Value N-CREATE	Value N-SET	Comments
Patient Age	0010,1010	MWL/USER			
Ethnic Group	0010,2160	MWL/USER			
Other Patient ID	0010,1000	MWL/USER			
Referenced Patient Sequence	0008,1120	EMPTY			
> Referenced SOP Class UID	0008,1150	EMPTY			
> Referenced Instance UID	0008,1155	EMPTY			
Scheduled Step Attributes Sequence	0040,0270	GENERATED			
>Accession Number	0008,0050	MWL/USER			
>Requested Procedure Description	0032,1060	MWL			
>Requested Procedure ID	0040,1001	MWL			
Performed Series Sequence	0040,0340	GENERATED			
>Retrieve AE Title	0008,0054	EMPTY			
>Series Description	0008,103E	EMPTY			
>Performing Physician's Name	0008,1050	MWL/USER			
>Operator's Name	0008,1070	MWL/USER			
>Referenced Image Sequence	0008,1140	EMPTY			
>> Referenced SOP Class UID	0008,1150	EMPTY			
>>Referenced SOP Instance UID	0008,1155	EMPTY			
>Protocol Name	0018,1030	GENERATED			
>Series Instance UID	0020,000E	GENERATED			
>Requested Procedure Code Sequence	0032,1064	GENERATED			
>Scheduled Procedure Step Description	0040,0007	MWL			
>Study Instance UID	0020,000D	MWL			
>Referenced Study Sequence	0008,1110	GENERATED			

Attribute Name	Tag	Source	Value N-CREATE	Value N-SET	Comments
>>Referenced SOP Class UID	0008,1150	MWL			
>>Referenced SOP Instance UID	0008,1155	MWL			
>Scheduled Protocol Code Sequence	0040,0008	GENERATED			
>>Code Meaning	0008,0104	MWL			
>>Code Value	0008,0100	MWL			
>>Coding Scheme Designator	0008,0102	MWL			
>Scheduled Procedure Step ID	0040,0009	MWL			
Modality	0008,0060	GENERATED			
Procedure Code Sequence	0008,1032	GENERATED			
>Code Meaning	0008,0104	MWL			
>Code Value	0008,0100	MWL			
>Coding Scheme Designator	0008,0102	MWL			
Performed Procedure Step Information					
Performed Location	0040,0243	CONFIGURATION			
Performed Procedure Step ID	0040,0253	GENERATED			
Performed Procedure Step Description	0040,0254	EMPTY			
Performed Procedure Step Start Date	0040,0244	GENERATED			
Performed Procedure Step Start Time	0040,0245	GENERATED			
Performed Procedure Step End Date	0040,0250	GENERATED			End of the examination
Performed Procedure Step End Time	0040,0251	GENERATED			End of the examination
Performed Procedure Step Status	0040,0252	GENERATED	IN PROGRESS	IN PROGRESS/ COMPLETE/ DISCONTINUED	IN PROGRESS or DISCONTINUE or COMPLETED
Performed Procedure Type Description	0040,0255	EMPTY			

PHILIPS

Attribute Name	Tag	Source	Value N-CREATE	Value N-SET	Comments
Performed Station AE Title	0040,0241	CONFIGURATION	For Cardiac Workstation 5000: CW5000 For Cardiac Workstation 7000: CW7000		
Performed Station Name	0040,0242	CONFIGURATION			
Procedure Code Sequence	0008,1032	GENERATED			
>Code Meaning	0008,0104	MWL			
>Code Value	0008,0100	MWL			
>Coding Scheme Designator	0008,0102	MWL			
Image Acquisition Results					
Modality	0008,0060	GENERATED	ECG	ECG	
Study ID	0020,0010	MWL			
Performed Protocol Code Sequence	0040,0260	GENERATED			
Performed Procedure Step End Date	0040,0250				
Performed Procedure Step End Time	0040,0251				
Performed Procedure Step Status	0040,0252				
Procedure Code Sequence	0008,1032				
>Code Meaning	0008,0104	GENERATED	12-lead ECG	12-lead ECG	
>Code Value	0008,0100	GENERATED			
>Coding Scheme Designator	0008,0102	GENERATED	SRT	SRT	
Performed Series Sequence I	0040,0340	GENERATED			
>Retrieve AE Title	0008,0054	EMPTY			
>Series Description	0008,103E	EMPTY			
>Performing Physician's Name	0008,1050	MWL/USER			
>Operators' Name	0008,1070	MWL/USER			
>Referenced Image Sequence	0008,1140	EMPTY			

Attribute Name	Tag	Source	Value N-CREATE	Value N-SET	Comments
>> Referenced SOP Class UID	0008,1150	EMPTY			
>>Referenced SOP Instance UID	0008,1155	EMPTY			
>Protocol Name	0018,1030	GENERATED			Exam Type: 12 Leads 15/16 Leads Timed ECG
>Series Instance UID	0020,000E	GENERATED			
> Referenced Non-Image Composite SOP Instance Sequence	0040,0220	EMPTY			
>> Referenced SOP Class UID	0008,1150	EMPTY			
>> Referenced SOP Instance UID	0008,1155	EMPTY			

5.2.2.2. SCP of the Modality Performed Procedure Step SOP Class – N/A

Not Applicable

5.2.3. Unified Worklist and Procedure Step Service – N/A

Not Applicable

5.2.4. Instance Availability Notification Service – N/A

Not Applicable

5.2.5. Storage Service

5.2.5.1. SCU of the Storage SOP Classes

The figure below shows sequencing of RWA for Storage as SCU.
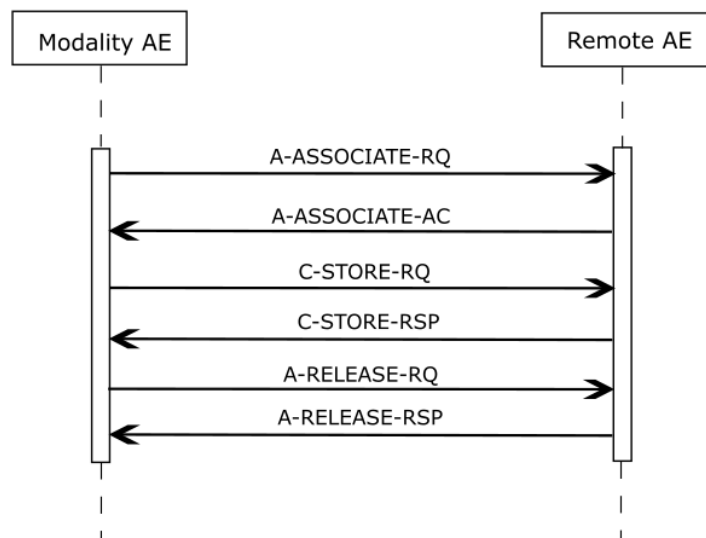
Figure 5-3: Real World Activity – Storage as SCU

As a Service Class User of the Storage Service Class, the Cardiac Workstation 5000/7000 uses the C-STORE-RQ message to request storage of DICOM objects by a remote SCP. See Section 1.1 Content and Transfer in the Overview for the list of supported SOP Classes.

For details regarding the content of SOP Instances that are created by the system, see Annexes A, which describes the underlying IOD of the supported SOP Classes.

5.2.5.1.1. Transcoding of Transfer Syntaxes – N/A

Not Applicable

5.2.5.2. SCU of the Storage SOP Classes – N/A

Not Applicable

5.2.6. Storage Commitment Service

5.2.6.1. SCU of the Storage Commitment SOP Class

The figure below shows sequencing of RWA for Storage Commitment as SCU.

Archive means that Cardiac Workstation 5000/7000 stores images with Storage Commitment.

The Cardiac Workstation 5000/7000 will request an association with the remote Storage SCP for the applicable Storage SOP Classes. After accepting the association, the Cardiac Workstation 5000/7000 will send the store request, wait for response, and the release the association. The store response status may be inspected on the UI. The Transferred image shall not be deleted from the system until the Storage Commit N-EVENT is received.

Depending on the status of the store the Cardiac Workstation 5000/7000 may queue store requests for retries. The queued store requests can be cancelled from the UI.

When an archive supports DICOM Storage Commitment, this node can be configured for it. For each image that is sent to this node, also a Storage Commitment Request is sent. The image is delete-protected until the Storage Commit Response has been received.

- Storage commitment request is marked as failure when - Storage Commitment missing for few objects.
- The N-EVENT-REPORT-RQ has a transaction UID value which is different from the transaction UID value that is sent in the N-ACTION-RQ.
- On receiving a storage commitment result the Application Entity will mark the not committed images as failed.
- The Storage AE will consider Storage Commitment failed if no N-EVENT-REPORT is received for a Transaction UID within a configurable time period after receiving a successful N-ACTION response.
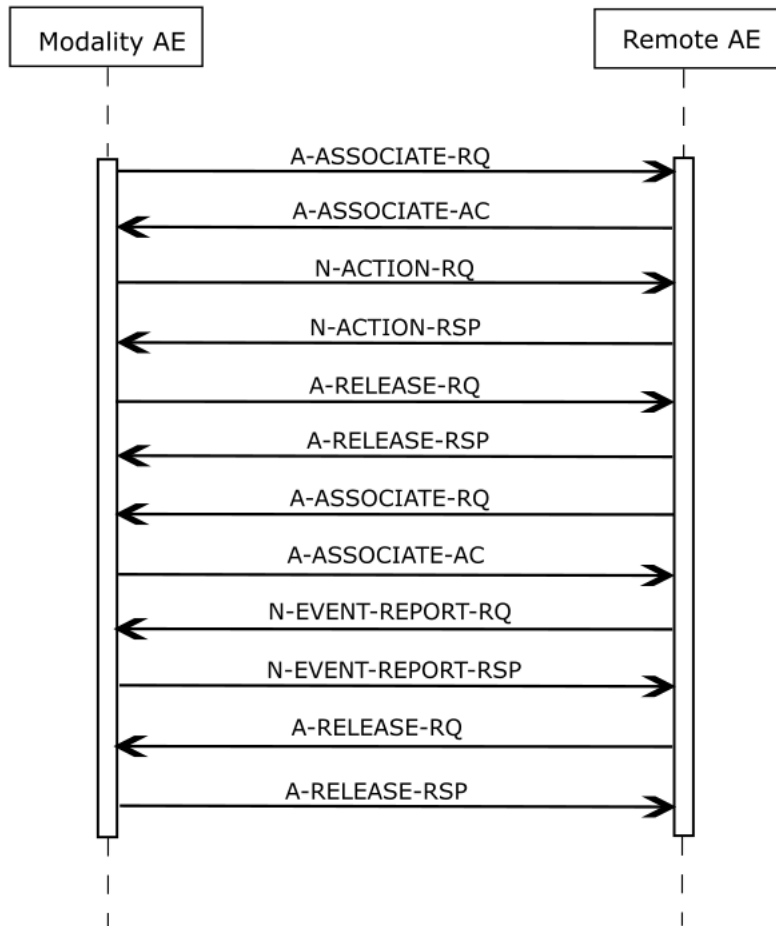
Figure 5-4: Real World Activity – Storage Commitment as SCU (Asynchronous)

As a Service Class User of the Storage Commitment SOP Class, the Cardiac Workstation 5000/7000 uses the N-ACTION-RQ message to request storage commitment from a remote SCP. In turn, it receives N-EVENT-REPORT-RQ messages from the SCP indicating success or failure of the request.

As a Service Class User of the Storage Commitment Push Model SOP Classes the product supports committing all Storage SOP Classes listed in Section 1.1 Content and Transfer are supported.

5.2.6.2. SCP of the Storage Commitment SOP Class – N/A

Not Applicable

5.2.7. Query/Retrieve Service Class – N/A

Not Applicable

5.2.8. Print Management Service – N/A

Not Applicable

5.2.9. Verification Service

5.2.9.1. SCU of the Verification Service SOP Class

The figure below shows sequencing of RWA for Verification as SCU.

PHILIPS
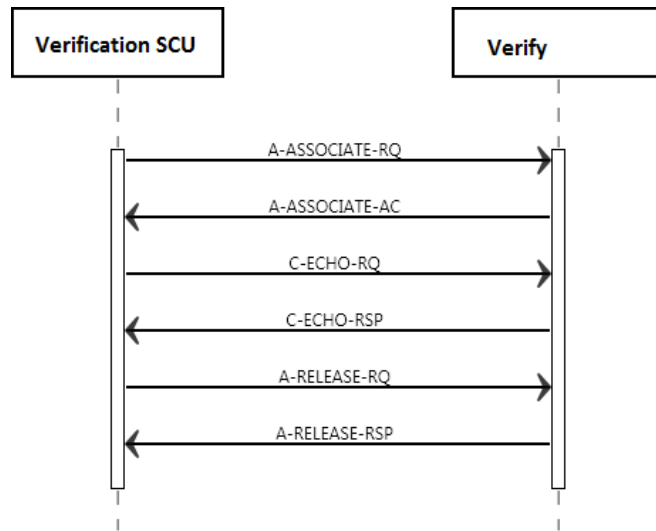
Figure 5-5: Real World Activity – Verification as SCU

As a Service Class User of the Verification Service Class, the Cardiac Workstation 5000/7000 uses the C-ECHO-RQ message to verify end-to-end communications with a remote DICOM AE. Upon receipt of the C-ECHO confirmation ECHO-RSP message, the SCU determines that verification is complete. For the list of supported DIMSE services see Section 1.2.

5.2.9.2. SCP of the Verification Service SOP Class – N/A

Not Applicable.

5.3. Supported DICOM Web Services – N/A

Not Applicable

5.4. Media Service – N/A

Not Applicable

5.5. Real Time Video Service – N/A

Not Applicable

5.6. Cross Service Considerations - N/A

Not Applicable

5.7. Specific Character Sets

For Specific Character Sets supported in addition to the default character repertoire, refer to Section 1.7 for the Values for Specific Character Set (0008,0005).

6. Configuration

Throughout all subsections the following Values can be used in the "Configurable" column:

- USER: The parameter is configurable by the user.
- SERVICE: The parameter is configurable by service personnel.
- FIXED: The parameter is not configurable (it has a fixed Value). The Value is required for the configuration of the remote system.
- N/A: The parameter is not applicable for the local or the remote system.

6.1. General Configuration Parameters

Table 6-1 lists general configuration parameters applicable across all supported DICOM Services.

Table 6-1: General Configuration Parameters

Parameter	Configurable	Default Value	Comments
General Parameters			
Timeout waiting for acceptance or rejection Response to an Association Open Request. (Application-Level timeout)	FIXED	30	
Timeout waiting for a response to an Association release request (Application-Level Timeout)	N/A	N/A	
General DIMSE level timeout Values	N/A	N/A	
TCP/IP Settings			
TCP/IP Send Buffer	N/A		Refer chapter 8.3
TCP/IP Receive Buffer	N/A		Refer chapter 8.3
TCP Port	N/A		Refer chapter 8.3
DICOM Services Parameters			
Maximum number of simultaneous Associations accepted	FIXED	1	
Specific Character Set	USER	ISO_IR 100	
TLS Configuration Parameters			
Secure Connection	User	OFF	Set ON for secure connection
Certificate and Private Key	User	N/A	
Trusted Root CA Certificate	User	N/A	

6.2. Configuration of DIMSE Services

The tables in the following subsections show the configuration parameters required for DIMSE Services.

In order to identify whether Cardiac Workstation 5000/7000 is an SCP and / or an SCU, the following applies:

- SCP: The (Secured) Local Called AET and Remote Calling AET parameters are present.
- SCU: The (Secured) Local Calling AET and Remote Called AET parameters are present.

6.2.1. Basic Worklist Management Service Configuration

Table 6-2 lists Worklist Service configuration parameters:

Table 6-2: Worklist Service Parameters

Local Worklist Configuration Parameters - Worklist Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Calling AE Title (SCU)	SERVICE	N/A	
Default Modality type	USER	N/A	Used to query the MWL SCP.
Default Scheduled Station AE Title	SERVICE	N/A	Used to query the remote MWL SCP
Remote Configuration Parameters - Worklist Service			
Called AE Title (SCP)	SERVICE	N/A	
Port	SERVICE	N/A	

6.2.2. Modality Performed Procedure Step Service Configuration

Table 6-3 lists Modality Performed Procedure Step Service configuration parameters:

Table 6-3: MPPS Service Parameters

Local Configuration Parameters - MPPS Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Calling AE Title (SCU)	SERVICE	N/A	The system uses the same Calling AE Title as for the Storage SCU service by default
Remote Configuration Parameters - MPPS Service			
Called AE Title (SCP)	SERVICE	N/A	
Port	SERVICE	N/A	

6.2.3. Unified Worklist and Procedure Step Service Configuration – N/A

Not Applicable

6.2.4. Instance Availability Notification Service Configuration – N/A

Not Applicable

6.2.5. Storage Service Configuration

Table 6-4 lists Storage Service configuration parameters:

Table 6-4: Storage Service Parameters

Local Configuration Parameters - Storage Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Calling AE Title (SCU)	SERVICE	N/A	

Local Configuration Parameters - Storage Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Remote Configuration Parameters - Storage Service			
Called AE Title (SCP)	SERVICE	N/A	
Port	SERVICE	N/A	

6.2.6. Storage Commitment Service Configuration

Table 6-5 lists Storage Commitment Service configuration parameters:

Table 6-5: Storage Commitment Service Parameters

Local Configuration Parameters - Storage Commitment Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Calling AE Title (SCU)	SERVICE	N/A	The system uses the same Calling AE Title as for the Storage SCU service by default
Delay to send N-ACTION-RQ	SERVICE	N/A	
Delay to send N-EVENT-REPORT-RQ	FIXED	N/A	As soon as the N-ACTION-RQ is received the system will initiate an Association to send the N-EVENT-REPORT
N-EVENT-REPORT on different Association (Asynchronous)	FIXED	N/A	When CW 5000/7000 SYSTEM sends as N-ACTION-RQ in one association and expects N-EVENT-REPORT in different association as asynchronous storage commitment is supported.
Remote Configuration Parameters - Storage commitment Service			
Called AE Title (SCP)	SERVICE	N/A	
Port	SERVICE	N/A	

6.2.7. Query/Retrieve Service Configuration – N/A

Not Applicable

6.2.8. Print Management Service Configuration – N/A

Not Applicable

6.2.9. Verification Service Configuration

Table 6-6 lists Storage Service configuration parameters:

Table 6-6: Verification Service Parameters

Local Configuration Parameters - Verification Service			
Parameter	**Configurable**	**Default Value**	**Comments**
Calling AE Title (SCU)	Yes	SERVICE	

PHILIPS

6.3. Configuration of DICOM Web Services – N/A

Not Applicable

6.4. Configuration of Media Storage Service – N/A

Not Applicable

6.5. Configuration of Real Time Video Service – N/A

Not applicable

6.6. Configuration of Audit Trail – Syslog – N/A

Not applicable

7. Network and Media Communication Details

7.1. General

The cross interaction between the AEs is depicted in the diagrams below.
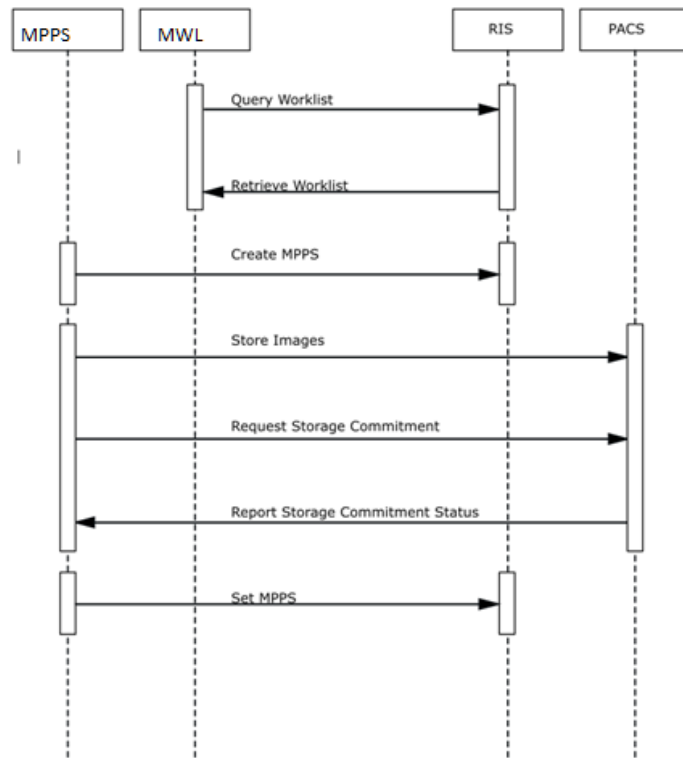
Figure 7-1: Real-World Activity and Cross AE interaction

7.1.1. General Association Parameters

Table 7-1 lists Association parameters applicable to all AEs on the system.

Table 7-1: General Association Parameters

	Name	Value
Networking Services	Application Context Name	1.2.840.10008.3.1.1.1

	Name	Value
	Implementation Class UID	For CW5000:1.3.46.670589.32.860439.1.1.0
		For CW7000:1.3.46.670589.32.860441.1.1.0
	Implementation Version Name	For CW5000: CW5000DCM_1_1_0
		For CW7000: CW7000DCM_1_1_0
	Maximum PDU Length	16384 (Fixed or not configurable)
	ARTIM Timeout	Default: 30s
	Maximum number of simultaneous Associations as Association Initiator	1
	Maximum number of simultaneous Associations as Association Acceptor	N/A
	Maximum number of outstanding asynchronous Transactions	1
Media Services	File Meta Information Version	N/A
	Implementation Class UID	N/A
	Implementation Version Name	N/A
Web Services	Maximum number of connections supported as Server	N/A

7.2. Specifications

7.2.1. Modality Worklist Application Entity

7.2.1.1. Sequencing of Real-World Activities for Modality Worklist
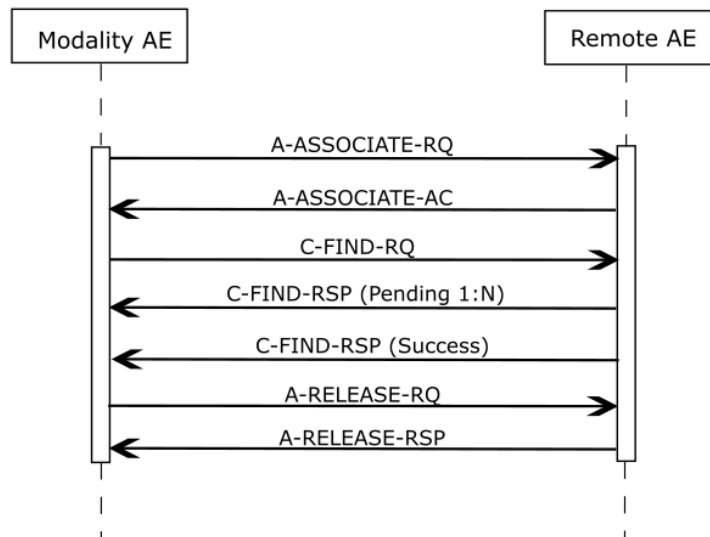
Figure 7-2: Sequencing of Real-World Activities for modality worklist

7.2.1.2. Association Parameters of Modality Worklist - N/A

Not applicable.

7.2.1.3. Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.1.3.1. Real-World Activity Modality Worklist

The operator of the Cardiac Workstation 5000/7000 can choose to retrieve an up-to-date worklist. To initiate this function, the operator will run a query (patient based query or broad query) from the cardiograph, with or without optional search criteria. When the operator starts the query process, the Cardiac Workstation 5000/7000 will query the DICOM Modality Worklist service provider for the Modality Worklist, using the search criteria if provided. The list of orders is returned to the cardiograph (Max.200) and displayed to the operator.
Extended negotiation is not supported.

7.2.1.4. Association Acceptance – N/A

Not Applicable

7.2.2. Modality Performed Procedure Step Application Entity

7.2.2.1. Sequencing of Real-World Activities for Modality Performed Procedure Step
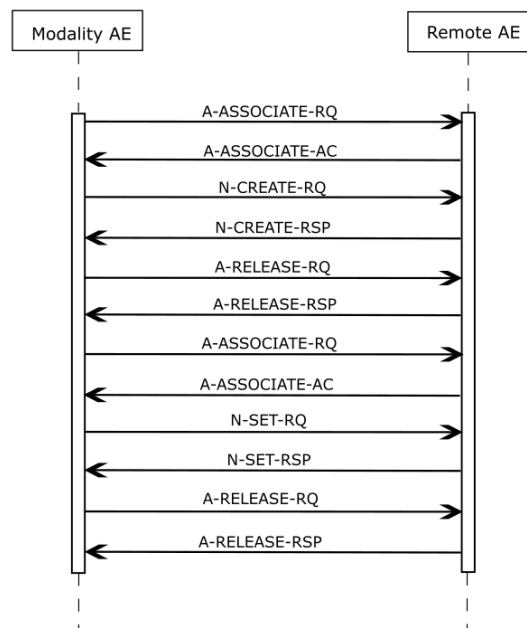
Figure 7-3: Sequencing of Real-World Activities for Modality Performed Procedure Step

7.2.2.2. Association Parameters of Modality Performed Procedure Step – N/A

Not applicable.

7.2.2.3. Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.2.3.1. Real-World Activity Modality Performed Procedure Step

When Cardiac Workstation 5000/7000 start the scan of an examination, an association is established with the SCP and send a N-CREATE message with all appropriate information about the examination on the Cardiac Workstation 5000/7000 scanner; the status will be set to IN-PROGRESS. After clicking on the "Transfer" button the Cardiac Workstation 5000/7000 will archive acquired images and send a N-SET message having status IN-PROGRESS and procedure end date and time information. After clicking on the "End Session" button Cardiac Workstation 5000/7000send a N-SET message (having status "COMPLETED" and procedure end date and time information). After starting the session, when the Cardiac Workstation 5000/7000 end the session without acquiring image, then Cardiac Workstation 5000/7000 send a N-SET message with status or "DISCONTINUED". The MPPS function is independent of the use of storage commitment. The sequence diagram in figure 7 shows the interaction for the MR System RWA Report MPPS.

Description of Activities

MPPS messages are only created for scheduled studies.

After the image for a Scheduled Procedure Step has been acquired, the system sets the MPPS status of the related examination to "IN PROGRESS" and generates an initial MPPS in progress message. The system does not generate intermediate MPPS in progress message for subsequent acquisitions of this Scheduled Procedure Step instance.

After finishing the appropriate acquisition(s), the system will change the MPPS status of the related examination to "COMPLETED: and generate and MPPS N-SET-FINAL message.

7.2.2.4. Association Acceptance – N/A

Not Applicable

7.2.3. Unified Worklist and Procedure Step Service - N/A

Not applicable

7.2.4. Instance Availability Notification Service – N/A

Not applicable

7.2.5. Image Export Application Entity

7.2.5.1. Sequencing of Real-World Activities for Image Export
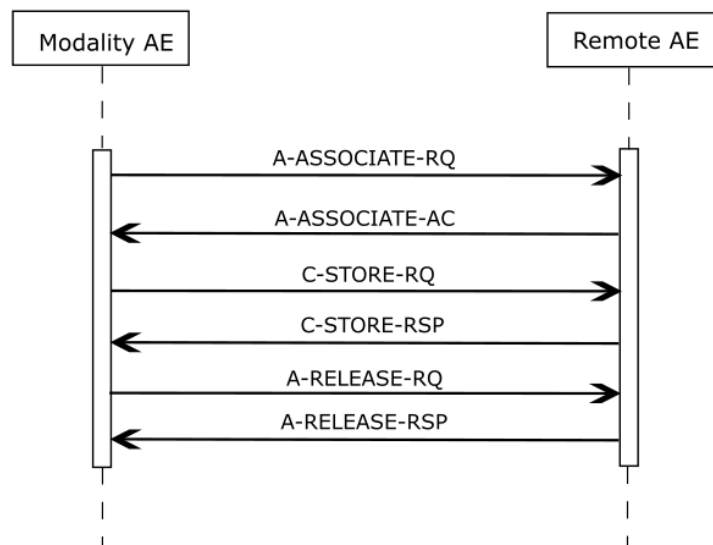
Figure 7-4: Sequencing of Real-World Activities for Image Export

7.2.5.2. Association Parameters of Image Export- N/A

Not applicable.

7.2.5.3. Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.5.3.1. Real-World Activity Image Export

After generating an ECG, Cardiac Workstation 5000/7000 will initiate transmission of the ECG. This causes the Cardiac Workstation 5000/7000 to store the ECG into the configured Storage SCP. ECGs are stored using the 12-Lead ECG Waveform Object or as a General ECG Waveform Object or as Encapsulated PDF Storage Object depending on the configuration settings.

7.2.5.4. Association Acceptance – N/A

Not Applicable

7.2.6. Storage Commitment Application Entity

7.2.6.1. Sequencing of Real-World Activities for Storage Commitment
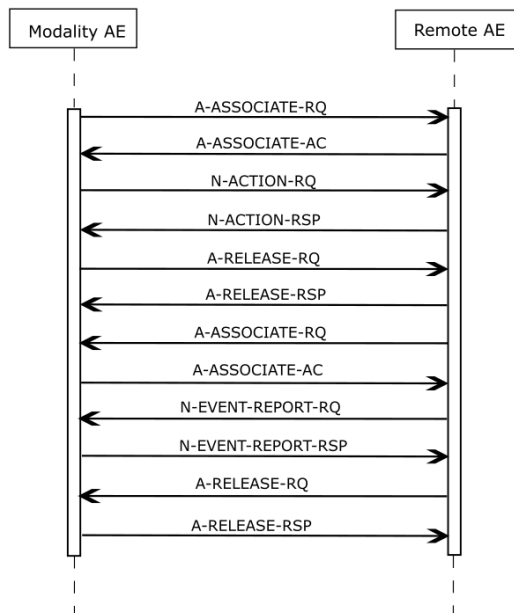
Figure 7-5: Sequencing of Real-World Activities for Storage Commitment

7.2.6.2. Association Parameters of Storage Commitment- N/A

Not applicable.

7.2.6.3. Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.6.3.1. Real-World Activity Storage Commitment

After generating an ECG, Cardiac Workstation 5000/7000 will initiate transmission of the ECG. This causes the Cardiac Workstation 5000/7000 to store the ECG into the configured Storage SCP. ECGs are stored using the 12-Lead ECG Waveform Object or as a General ECG Waveform Object or as Encapsulated PDF Storage Object depending on the configuration settings. Archive means that Cardiac Workstation

5000/7000 stores images with Storage Commitment. The Cardiac Workstation 5000/7000 will request an association with the remote Storage SCP for the applicable Storage SOP Classes. After accepting the association, the Cardiac Workstation 5000/7000 will send the store request, wait for response, and the release the association. The store response status may be inspected on the UI. The Transferred image shall not be deleted from the system until the Storage Commit N-EVENT is received. Depending on the status of the store the Cardiac Workstation 5000/7000 may queue store requests for retries. The queued store requests can be cancelled from the UI. When an archive supports DICOM Storage Commitment, this node can be configured for it. For each image that is sent to this node, also a Storage Commitment Request is sent. The image is delete-protected until the Storage Commit Response has been received.

7.2.6.4. Association Acceptance – N/A

Not applicable

7.2.7. Query/Retrieve Service Class – N/A

Not applicable

7.2.8. Print Management Service – N/A

Not applicable

7.2.9. Verification Service

7.2.9.1. Sequencing of Real-World Activities for Verification
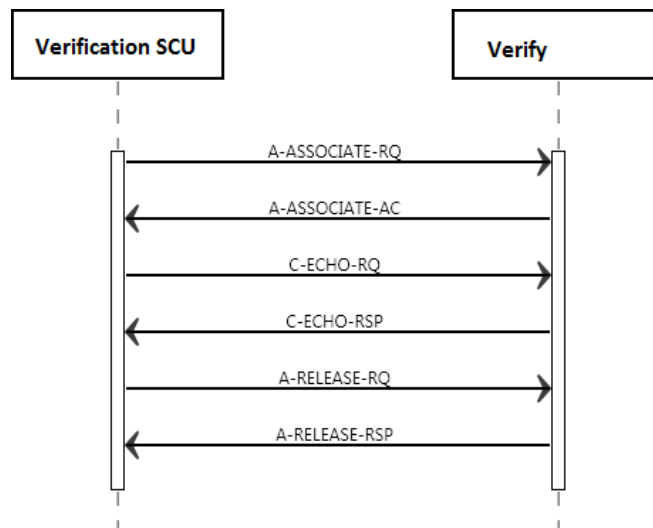
Figure 7-6: Sequencing of Real-World Activities for Verification

7.2.9.2. Association Parameters of Verification – N/A

Not applicable.

7.2.9.3. Association Initiation

This section details the Association policies of the Application Entity when it is initiating an Association.

7.2.9.3.1. Real-World Activity Verification

PHA requests verification to a remote system using the C-ECHO command.

7.2.9.4. Association Acceptance – N/A

Not Applicable

7.3. Status Codes

The following sections describe the Status Codes supported by the system for each implemented service as well as the reason for issuing specific Status codes or the associated behavior when receiving it.

7.3.1. General AE Communication and Failure Behavior and Handling

7.3.1.1. Communication Failure Behavior as Association Initiator

Table 7-2 describes behavior of the AE if a communication failure occurs when it initiated an Association.

Table 7-2: DICOM Communication Failure Behavior as Association Initiator

Failure	Failure Behavior		
Timeout	The Association is aborted using A-ABORT and command marked as failed. The reason is logged and reported to the user.		
Association aborted	**Source**	**Failure Reason**	**Failure Behaviour**
	0 - DICOM UL service-user (initiated abort)	0 - reason-not-specified	When association abort occurs, ECG CW 5000/7000 displays "DICOM Failure" with status Code FFFFH
	2 - DICOM UL service-provider (initiated abort)	0 - reason-not-specified	
		1 - unrecognized-PDU	
		2 - unexpected-PDU	
		4 - unrecognized-PDU-parameter	
		5 - unexpected-PDU-parameter	
		6 - invalid-PDU-parameter-value	
Association Rejection	**Source**	**Failure Reason**	**Failure Behaviour**
	1 - rejected-permanent/ 1 - DICOM UL service-user	1 - no-reason-given	When association rejection occurs, ECG CW 5000/7000 displays "DICOM Failure" with status Code FFFFH
		2 - application-context-name-not supported	
		3 - calling-AE-title-not-recognized	
		7 - called-AE-title-not-recognized	
	2 - DICOM UL service-provider (ACSE related function)	1 - no-reason-given	
		2 - protocol-version-not-supported	
	3 - DICOM UL service-provider (Presentation related function)	1 - temporary-congestion	
		2 - local-limit-exceeded	
	2 - rejected-transient/ 1 - DICOM UL service-user	1 - no-reason-given	
		2 - application-context-name-not-supported	
		3 - calling-AE-title-not-recognized	

Failure	Failure Behavior		
		7 - called-AE-title-not-recognized	
	2 - DICOM UL service-provider (ACSE related function)	1 - no-reason-given	
		2 - protocol-version-not-supported	
	3 - DICOM UL service-provider (Presentation related function)	1 - temporary-congestion	
		2 - local-limit-exceeded	
Network Disconnect	The command is marked as failed. The reason is logged and reported to the user. Automatic retry of this service connection is started		

7.3.1.2. Communication Failure Handling as Association Acceptor - N/A

Not Applicable

7.3.2. DIMSE Services

7.3.2.1. Basic Worklist Management Service

7.3.2.1.1. SCU of the Modality Worklist Information Model Find SOP Class - C-FIND

Table 7-3 lists the Status Codes that the SCU of the Modality Worklist Information Model Find SOP Class supports for the C-FIND message and defines the application behavior when encountering the listed Status Codes.

Table 7-3: Status Codes for C-FIND of the Modality Worklist Information Model SOP Class - SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Matching is complete - No final identifier is supplied	0000	The SCP has successfully returned all matching information
Failure	Refused: Out of Resources	A700	The Association is closed. The worklist is not replaced.
	SOP Class Not Supported	0122	The Association is closed. The worklist is not replaced.
	Error: Identifier does not match SOP Class	A900	The Association is closed. The worklist is not replaced.
	Error: Unable to process.	C000-CFFF	The Association is closed. The worklist is not replaced.
Cancel	Matching terminated due to cancel	FE00	The user is notified that a partial list was retrieved. The retrieved items can be displayed by user request
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	FF00	The user is notified that the matching list is retrieved and continuing for further matches. The retrieved items can be displayed by user request.
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier	FF01	

Service Status	Further Meaning	Status Code	Behavior
Abort	Association is aborted	A-Abort	The Association is aborted using A-ABORT and the worklist query is marked as failed.

7.3.2.1.2. SCP of the Modality Worklist Information Model Find SOP Class - C-FIND- N/A

Not Application

7.3.2.2.   Modality Performed Procedure Step Service

7.3.2.2.1. SCU of the Modality Performed Procedure Step SOP Class - N-CREATE

Table 7-4 lists the Status Codes that the SCU of the Modality Performed Procedure Step SOP Class supports for the N-CREATE message and defines the application behavior when encountering the listed Status Codes.

Table 7-4: Status Codes for N-CREATE of the Modality Performed Procedure Step SOP Class - SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Attribute Value Out of Range	0116	The SCP sends a warning message when attribute value out of range
	Attribute List Error	0107	The SCP sends a warning message when attribute list of error
Failure	No Such Attribute	0105	The Association is aborted.
	Invalid Attribute Value	0106	The Association is aborted.
	Processing Failure	0110	The Association is aborted.
	Duplicate SOP Instance	0111	The Association is aborted.
	Attribute Value Out of Range	0116	The Association is aborted.
	Invalid Object Instance	0117	The Association is aborted.
	No Such SOP Class	0118	The Association is aborted.
	Missing Attribute	0120	The Association is aborted.
	Missing Attribute Value	0121	The Association is aborted.
	Refused: Not Authorized	0124	The Association is aborted.
	Duplicate Invocation	0210	The Association is aborted.
	Unrecognized Operation	0211	The Association is aborted.
	Mistyped Argument	0212	The Association is aborted.
	Resource Limitation	0213	The Association is aborted.

7.3.2.2.2. SCU of the Modality Performed Procedure Step SOP Class - N-SET

Table 7-5 lists the Status Codes that the SCU of the Modality Performed Procedure Step SOP Class supports for the N-SET message and defines the application behavior when encountering the listed Status Codes.

Table 7-5: Status Codes for N-SET of the Modality Performed Procedure Step SOP Class — SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Attribute Value Out of Range	0116	The SCP sends a warning message when attribute value out of range
	Attribute List Error	0107	The SCP sends a warning message when attribute list of error
Failure	No Such Attribute	0105	The Association is aborted.
	Invalid Attribute Value	0106	The Association is aborted.
	Processing Failure - Performed Procedure Step Object may no longer be updated	0110	The Association is aborted.
	Processing Failure	0110	The Association is aborted.
	Attribute Value Out of Range	0116	The Association is aborted.
	Invalid Object Instance	0117	The Association is aborted.
	No Such SOP Class	0118	The Association is aborted.
	Class-Instance Conflict	0119	The Association is aborted.
	Missing Attribute Value	0121	The Association is aborted.
	Refused: Not Authorized	0124	The Association is aborted.
	Duplicate Invocation	0210	The Association is aborted.
	Unrecognized Operation	0211	The Association is aborted.
	Mistyped Argument	0212	The Association is aborted.
	Resource Limitation	0213	The Association is aborted.

7.3.2.2.3. SCP of the Modality Performed Procedure Step SOP Class - N-CREATE – N/A

Not Applicable

7.3.2.2.4. SCP of the Modality Performed Procedure Step SOP Class - N-SET – N/A

Not Applicable

7.3.2.3. Unified Worklist und Procedure Step Service – N/A

Not Applicable

7.3.2.4. Instance Availability Notification Service – N/A

Not Applicable

7.3.2.5. Storage Service

7.3.2.5.1. SCU of the Storage SOP Classes - C-STORE

Table 7-6 lists the Status Codes that the SCU of the Storage SOP Class supports for the C-STORE message and defines the application behavior when encountering the listed Status Codes.

Table 7-6: Status Codes C-STORE for the Storage SOP Classes - SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instance. If all SOP Instances succeed, the job is marked as complete.
Warning	Coercion of Data Elements	B000	The SCP successfully stored the SOP Instance. Warning reason is logged in application logs and association is released.
	Data Set does not match SOP Class	B007	
	Elements Discarded	B006	
Failure	SOP Class not supported	0112	Storage operation is failed. Failure reason is logged in application logs and association is released.
	Invalid Object Instance	0117	
	Duplicate Invocation	0210	
	Unrecognized Operation	0211	
	Mistyped Argument	0212	
	Not authorized	0214	
	Out of Resources	A700-A7FF	
	Data Set does not match SOP Class	A900-A9FF	
	Cannot Understand	C000-CFFF	
	Association is aborted	A-Abort	Storage operation is failed. "Peer Aborted Association" is logged in application logs.

7.3.2.5.2. SCP of the Storage SOP Classes - C-STORE – N/A

Not Applicable

7.3.2.6. Storage Commitment Service

7.3.2.6.1. SCU of the Storage Commitment Push Model SOP Class - N-ACTION

Table 7-7 lists the Status Codes that the SCU of the Storage Commitment Push Model SOP Class supports for the N-ACTION message and defines the application behavior when encountering the listed Status Codes.

Table 7-7: Status Codes for N-ACTION of the Storage Commitment Push Model SOP Class - SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instance. If all SOP Instances succeed, the job is marked as complete.

PHILIPS

Service Status	Further Meaning	Status Code	Behavior
Failure	Processing failure	0110	Storage Commitment is failed. Reason for the failure is logged in application logs and association is released.
	No such SOP Instance	0112	
	No such argument	0114	
	Invalid argument Value	0115	
	Invalid Object instance	0117	
	No such SOP Class	0118	
	Class-instance conflict	0119	
	No such action	0123	
	Refused: Not Authorized	0124	
	Duplicate invocation	0210	
	Unrecognized operation	0211	
	Mistyped argument	0212	
	Resource limitation	0213	

7.3.2.6.2. SCU of the Storage Commitment Push Model SOP Class - N-EVENT-REPORT

Table 7-8 lists the Status Codes that the SCU of the Storage Commitment Push Model SOP Class supports for the N-EVENT-REPORT message and defines the application behavior when encountering the listed Status Codes.

Table 7-8: Status Codes for N-EVENT-REPORT for the Storage Commitment Push Model SOP Class - SCU

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The storage commitment result has been successfully received
Failure	Processing failure	0110	Storage Commitment is failed and association is released.
	No such SOP Instance	0112	
	No such argument	0114	
	Invalid argument Value	0115	
	Invalid Object instance	0117	
	No such SOP Class	0118	
	Class-instance conflict	0119	
	No such action	0123	
	Refused: Not Authorized	0124	
	Duplicate invocation	0210	
	Unrecognized operation	0211	
	Mistyped argument	0212	

7.3.2.6.3. SCP of the Storage Commitment Push Model SOP Class - N-ACTION – N/A

Not Applicable

7.3.2.6.4. SCP of the Storage Commitment Push Model SOP Class - N-EVENT-REPORT – N/A

Not Applicable

7.3.2.7. Query/Retrieve Service – N/A

Not Applicable

7.3.2.8. Print Management Service – N/A

Not Applicable

7.3.2.9. Verification Service

7.3.2.9.1. SCU of the Verification SOP Class - C-ECHO

Table 7-9 lists the Status Codes that the SCU of the Storage SOP Class supports for the C-ECHO message and defines the application behaviour when encountering the listed Status Codes.

Table 7-9: Status Codes C-ECHO for the Verification SOP Class - SCU

Service Status	Further Meaning	Status Code	Behaviour
Success	Success	0000	"Connection Succeeded" appears
Failure	Refused: SOP Class not supported	0122H	Indicates that a different SOP Class than the Verification SOP Class was specified, which was not supported
	Duplicate invocation	0210H	Indicates that the message ID (0000,0110) specified is allocated to another notification or operation
	Mistyped argument	0212H	Indicates that one of the parameters supplied has not been agreed for use on the Association between the DIMSE service users
	Unrecognized operation	0211H	Indicates that the different SOP Class than the verification SOP Class was specified, which does not recognize a C-ECHO operation

7.3.2.9.2. SCP of the Verification SOP Class - C-ECHO - N/A

Not applicable

7.3.3. DICOM Web Services – N/A

Not Applicable

8. Security

8.1. Introduction

The security section describes security features implemented by this product. It includes descriptions of non-DICOM network protocols, information to configure firewalls and application whitelists, lists of

PHILIPS

supported DICOM security profiles as well as Web Security features. Additionally, secured media storage, VPN, etc. are also specified in this security section.

8.2. External Network Requirements

Table 8-1 describes additional non-DICOM network protocols that are used by Cardiac Workstation 5000/7000.

Table 8-1: External Network Requirements

Profile	Actor	Transaction	Protocol Used	RFCs	Security Support	Reference
Basic Time Synchronization	NTP Client	Maintain Time	NTP	RFC5905	No	C.1.1
		Find NTP Servers	NTP	RFC5905	No	C.1.1

8.3. TCP Port Configuration

Not applicable since CW 5000/7000 is client and TCP configuration required only for the Server.

8.4. DICOM Security Profiles Support

8.4.1. Secure Use and User Identity Profiles – N/A

Not applicable since CW5000/7000 does not support this profile.

8.4.2. Secure Transport Connection Profiles

Table 8-3 describes the Secure Transport Connection Profiles supported by the product. Accepted cipher suites are described in the section listed in the "Reference" column.

Table 8-3: Secure Transport Connection Profiles

Profile	Secured AE	Sender	Receiver	Reference
BCP 195 RFC 8996 TLS Secure Transport Connection Profile	ECG (Configurable)	Yes	N/A	C.2.5

8.4.3. Media Storage Security Profiles – N/A

Not applicable since CW5000/7000 does not support this profile.

8.4.4. Attribute Confidentiality Profiles – N/A

Not applicable since CW5000/7000 does not support this profile.

8.4.5. Digital Signature Profiles – N/A

Not applicable since CW5000/7000 does not support this profile.

8.4.6. Additional DICOM Security Profiles – N/A

Not applicable since CW5000/7000 does not support an additional DICOM security profile.

8.5. User Identity Negotiation Support – N/A

Not applicable since CW5000/7000 does not support any User Identity Negotiation.

8.6. Web Services Security Features – N/A

Not applicable since CW5000/7000 does not support Web services.

8.7. Other Security Features – N/A

Not applicable since CW5000/7000 does not support other security features.

Annexes

A   Information Object Definitions (IODs)

This section describes all the SOP Instances natively created by Cardiac Workstation 5000/7000, e.g. images created by an acquisition modality or evidence documents created on a review workstation (i.e., all SOP Classes that are marked in the "Created" column in Table 1-1).

In the "Source" column, the following Values can be used:

- FIXED: The Value is pre-defined and cannot be modified.
- GENERATED: The Value is generated by the system.
- CONFIGURATION: The Value is copied from the system configuration.
- MWL: The Value is copied from a Modality Worklist entry.
- QUERY: The Value is determined by performing a query of any of the supported Query/Retrieve Services.
- USER: The Value is entered by the user.
- SCANNED: The Value is read from a barcode scanner or similar device.
- EMPTY: The Attribute is sent with a zero-length Value.
- SRC_INSTANCE: The Value is copied from previously created/received SOP Instances.

The "Presence" columns reflect the usage of the Module, Functional Group Macro, Attributes, or Value in the Cardiac Workstation 5000/7000 Implementation and is not necessarily the same as defined in the DICOM Standard. For the "Presence" column the following Values can be used:

- ALWAYS: the module, functional group macro, Attributes or Value is always present.
- CONDITIONAL: the presence of the module, functional group macro, Attributes or Value is dependent on a condition. The condition must be listed in the "Conditions" column.
- SRC_COPY: The presence of the Attributes and Values depends on the availability of these in the source instances, which are used for copying this information.
- EMPTY: The Attribute is present but without a Value (zero length).

A.1   Information Shared Across Multiple IODs

A.1.1   Common Modules

All SOP Instances generated by the system use the common modules listed in Table A-1 to 6 or a subset of them, as defined in the IOD specific subsections below.

Table A-1. Patient Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Patient's Name	0010,0010	MWL	ALWAYS	CONDITIONAL			
Patient ID	0010,0020	MWL	ALWAYS	CONDITIONAL			Primary hospital identification number or code for the patient.
Patient's Birth Date	0010,0030	MWL	ALWAYS	CONDITIONAL			
Patient's Sex	0010,0040	MWL	ALWAYS	CONDITIONAL			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Ethnic Group	0010,2160	MWL	CONDITIONAL	CONDITIONAL			
Other Patient IDs	0010,1000	MWL	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class
Patient Comments	0010,4000	MWL	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class

Table A-2. General Study Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Study Date	0008,0020	GENERATED	ALWAYS	CONDITIONAL			Acquisition Date – output only
Study Time	0008,0030	GENERATED	ALWAYS	CONDITIONAL			Acquisition Time – output only
Accession Number	0008,0050	MWL	ALWAYS	CONDITIONAL			A number that identifies the order for the study (Order Number)
Referring Physician's Name	0008,0090	MWL	ALWAYS	CONDITIONAL			Referring Doctor Name
Study Description	0008,1030	MWL	CONDITIONAL	CONDITIONAL			Test Reason
Study Instance UID	0020,000D	MWL	ALWAYS	ALWAYS			For MWL, or generated by HPM CW5000/7000 using: DECG prefix: 1.3.46.670589.32 Time Clock Random Number
Study ID	0020,0010	MWL	ALWAYS	CONDITIONAL			For output this will be blank.
Issuer of Accession	0008,0051	GENERATED; MWL	CONDITIONAL	ALWAYS			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Number Sequence							
Procedure Code Sequence	0008,1032	GENERATED; MWL	ALWAYS	ALWAYS			

Table A-3. General Series Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Modality	0008,0060	FIXED	ALWAYS	ALWAYS	ECG		
Operators' Name	0008,1070	USER	CONDITIONAL	CONDITIONAL			Attribute is present in General Waveform and Encapsulated PDF Storage SOP. Technician Name
Series Instance UID	0020,000E	GENERATED	ALWAYS	ALWAYS			HPM CW5000/7000 will generate this as: DECG prefix: 1.3.46.670589.32 Time Clock Random Number Suffix: 1
Series Number	0020,0011	MWL	ALWAYS	CONDITIONAL			For output this will be blank
Referenced Performed Procedure Step Sequence	0008,1111	GENERATED	CONDITIONAL	ALWAYS			
>Referenced SOP Class UID	0008,1150	GENERATED	ALWAYS	ALWAYS			
>Referenced SOP Instance UID	0008,1155	GENERATED	ALWAYS	ALWAYS			
Performed Procedure Step Start Date	0040,0244	GENERATED	CONDITIONAL	ALWAYS			
Performed Procedure Step Start Time	0040,0245	GENERATED	CONDITIONAL	ALWAYS			

PHILIPS

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Performed Procedure Step ID	0040,0253	GENERATED	CONDITIONAL	ALWAYS			
Performed Procedure Step Description	0040,0254	GENERATED	CONDITIONAL	ALWAYS			
Performed Protocol Code Sequence	0040,0260	GENERATED	ALWAYS	ALWAYS			
>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS			
>Coding Scheme Designator	0008,0102	GENERATED	CONDITIONAL	ALWAYS			
>Code Meaning	0008,0104	GENERATED	ALWAYS	ALWAYS			
Request Attributes Sequence	0040,0275	GENERATED	CONDITIONAL	ALWAYS			
>Requested Procedure Description	0032,1060	GENERATED	ALWAYS	ALWAYS			
>Requested Procedure Code Sequence	0032,1064	GENERATED	ALWAYS	ALWAYS			
>Scheduled Procedure Step Description	0040,0007	GENERATED	ALWAYS	ALWAYS			
>Scheduled Protocol Code Sequence	0040,0008	GENERATED	ALWAYS	ALWAYS			
> Scheduled Procedure Step ID	0040,0009	GENERATED	ALWAYS	ALWAYS			
>Requested Procedure ID	0040,1001	GENERATED	ALWAYS	ALWAYS			

Table A-4: General Equipment Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Manufacturer	0008,0070	FIXED	ALWAYS	CONDITIONAL	Philips		
Institution Name	0008,0080	MWL; USER	CONDITIONAL	ALWAYS			If the institution name in MWL is empty, the local institution name is used.
Station Name	0008,1010	CONFIGURATION	CONDITIONAL	ALWAYS			Value is empty
Institutional Department Name	0008,1040	USER	CONDITIONAL	ALWAYS			
Manufacturer's Model Name	0008,1090	FIXED	CONDITIONAL	ALWAYS	860439		
Software Version(s)	0018,1020	GENERATED	CONDITIONAL	ALWAYS	1.1.0.x.y-z		x.y-z is the detailed software build.
Institution Address	0008,0081	GENERATED; MWL	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage

Table A-5. Patient Study Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Patient's Age	0010,1010	USER	ALWAYS	CONDITIONAL			
Patient's Size	0010,1020	USER	ALWAYS	CONDITIONAL			
Patient's Weight	0010,1030	USER	ALWAYS	CONDITIONAL			
Admission ID	0038,0010	MWL	CONDITIONAL	CONDITIONAL			Attribute is present in General ECG

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
							Waveform SOP Class
Admitting Diagnoses Description	0008,1080	GENERATED	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class
Admitting Diagnoses Code Sequence	0008,1084	GENERATED	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class
Occupation	0010,2180	MWL	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class
Additional Patient History	0010,21B0	GENERATED	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class
Patient's Sex Neutered	0010,2203	GENERATED	CONDITIONAL	CONDITIONAL			Attribute is present in Encapsulated PDF Storage SOP Class

Table A-6: SOP Common Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Specific Character Set	0008,0005	GENERATED	CONDITIONAL	ALWAYS			
Instance Creation Date	0008,0012	GENERATED	CONDITIONAL	ALWAYS			
Instance Creation Time	0008,0013	GENERATED	CONDITIONAL	ALWAYS			
SOP Class UID	0008,0016	GENERATED	ALWAYS	ALWAYS			This will be the 12- Lead ECG SOP Class "1.2.840.10008.5.1.4.1.1.9.1.1" or it will be the General ECG SOP Class "1.2.840.10008.5.1.4.1.1.9.1.2" depending on the configuration settings.
SOP Instance UID	0008,0018	GENERATED	ALWAYS	ALWAYS			
Instance Number	0020,0013	GENERATED	CONDITIONAL	ALWAYS			

A.1.2   Common Functional Group Macros – N/A

Not Applicable

A.1.3   Common Private Modules – N/A

Not Applicable

A.2   12-Lead ECG Waveform Storage SOP Class

Table A-7 defines the structure of 12-Lead ECG Waveform Storage SOP Class Instances

Table A-7: IOD of Created 12-Lead ECG Waveform Storage SOP Class Instances

IE	Module Name	Presence (Module)	Condition	Reference
Patient	Patient Module	ALWAYS		Table A-1
Study	General Study Module	ALWAYS		Table A-2
	Patient Study Module	ALWAYS		Table A-5
Series	General Series Module	ALWAYS		Table A-3

IE	Module Name	Presence (Module)	Condition	Reference
Equipment	General Equipment Module	ALWAYS		Table A-4
Waveform	SOP Common Module	ALWAYS		Table A-6
	Acquisition Context Module	ALWAYS		Table A-8
	Waveform Identification Module	ALWAYS		Table A-9
	Waveform Module	ALWAYS		Table A-10
	Waveform Annotation	CONDITIONAL		Table A-12
Extended	Extended Attributes	CONDITIONAL		Table A-11

A.2.1   12-Lead ECG Waveform Storage SOP Class Instances Specific Modules

The following tables list Modules and Attributes specific for 12-Lead ECG

Table A-8. Acquisition Context Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Acquisition Context Sequence	0040,0555	GENERATED	ALWAYS	CONDITIONAL			
>Value Type	0040,A040	FIXED	ALWAYS	CONDITIONAL	CODE		
>Concept Name Code Sequence	0040,A043	FIXED	ALWAYS	ALWAYS			A concept that constrains the meaning of (i.e., defines the role of) observation value.
>>Code Value	0008,0100	FIXED	CONDITIONAL	ALWAYS	5.4.5-33-1-1		
>>Coding Scheme Designator	0008,0102	FIXED	CONDITIONAL	ALWAYS	SCPECG		
>>Coding Scheme Version	0008,0103	FIXED	CONDITIONAL	ALWAYS	1.3		
>>Code Meaning	0008,0104	FIXED	CONDITIONAL	ALWAYS	Electrode Placement		
>Concept Code Sequence	0040,A168	CONFIGURATION	ALWAYS	ALWAYS			This is the Value component of a

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
							Name/Value pair when the Concept implied by Concept Name Code Sequence (0040,A043) is a Coded Value.
>>Code Value	0008,0100	CONFIGURATION	CONDITIONAL	ALWAYS	5.4.5-33-1-1		
>>Coding Scheme Designator	0008,0102	CONFIGURATION	CONDITIONAL	ALWAYS	SCPECG		
>>Coding Scheme Version	0008,0103	CONFIGURATION	CONDITIONAL	ALWAYS	1.3		
>>Code Meaning	0008,0104	CONFIGURATION	CONDITIONAL	ALWAYS	Standard 12-Lead Positions		

Table A-9: Waveform Identification Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Content Date	0008,0023	GENERATED	ALWAYS	ALWAYS			
Acquisition Datetime	0008,002A	GENERATED	ALWAYS	ALWAYS			
Content Time	0008,0033	GENERATED	ALWAYS	ALWAYS			
Instance Number	0020,0013	FIXED	ALWAYS	ALWAYS	1		

Table A-10: Waveform Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Waveform Sequence	5400,0100	GENERATED	ALWAYS	ALWAYS			
> Multiplex Group Time Offset	0018,1068	GENERATED	ALWAYS	ALWAYS			
>Trigger Time Offset	0018,1069	GENERATED	ALWAYS	ALWAYS			
>Waveform Originality	003A,0004	FIXED	ALWAYS	ALWAYS			'ORIGINAL'-Rhythm data, 'DERIVED'-

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
							Median data
>Number of Waveform Channels	003A,0005	CONFIGURATION	ALWAYS	ALWAYS			
>Number of Waveform Samples	003A,0010	GENERATED	ALWAYS	ALWAYS			(Lead Sample Count / Median Sample Count)
>Sampling Frequency	003A,001A	GENERATED	ALWAYS	ALWAYS			
>Multiplex Group Label	003A,0020	FIXED	CONDITIONAL	ALWAYS			RHYTHM-First Group, MEDIAN BEAT-second group
>Channel Definition Sequence	003A,0200	GENERATED	ALWAYS	ALWAYS			
>>Channel Status	003A,0205	GENERATED	ALWAYS	ALWAYS			
>>Channel Source Sequence	003A,0208	GENERATED	ALWAYS	ALWAYS			Sequence of one or more Items which further qualify the Waveform Source.
>>>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS			This is the code for the lead
>>>Coding Scheme Designator	0008,0102	FIXED	CONDITIONAL	ALWAYS	SCPECG		
>>>Coding Scheme Version	0008,0103	FIXED	CONDITIONAL	ALWAYS	1.3		
>>>Code Meaning	0008,0104	GENERATED	CONDITIONAL	ALWAYS			This is the lead name.
>>Channel Sensitivity	003A,0210	GENERATED	CONDITIONAL	ALWAYS			Value will be different according to 500sps or 1000sps format of ECG for the report

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>>Channel Sensitivity Units Sequence	003A,0211	FIXED	CONDITIONAL	ALWAYS			
>>>Code Value	0008,0100	FIXED	CONDITIONAL	ALWAYS	uV		
>>>Coding Scheme Designator	0008,0102	FIXED	CONDITIONAL	ALWAYS	UCUM		
>>>Coding Scheme Version	0008,0103	FIXED	CONDITIONAL	ALWAYS	1.4		
>>>Code Meaning	0008,0104	FIXED	CONDITIONAL	ALWAYS	microvolt		
>>Channel Sensitivity Correction Factor	003A,0212	FIXED	CONDITIONAL	ALWAYS			
>>Channel Baseline	003A,0213	FIXED	CONDITIONAL	ALWAYS	0		Multiplier to be applied to encoded sample values to match units specified in Channel Sensitivity (003A,0210).
>>Channel Sample Skew	003A,0215	FIXED	CONDITIONAL	ALWAYS	0		
>>Waveform Bits Stored	003A,021A	GENERATED	ALWAYS	ALWAYS	16		
>>Filter Low Frequency	003A,0220	CONFIGURATION	CONDITIONAL	ALWAYS			
>>Filter High Frequency	003A,0221	CONFIGURATION	CONDITIONAL	ALWAYS			
>>Notch Filter Frequency	003A,0222	CONFIGURATION	CONDITIONAL	ALWAYS			
>Waveform Bits Allocated	5400,1004	GENERATED	ALWAYS	ALWAYS	16		
>Waveform Sample Interpretation	5400,1006	FIXED	ALWAYS	ALWAYS	SS		
>Waveform Data	5400,1010	GENERATED	ALWAYS	ALWAYS			

Table A-1: Extended Attributes Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Visit Comments	0038,4000	USER	CONDITIONAL	ALWAYS			User-defined comments about the visit
Other Patient IDs	0010,1000	USER	CONDITIONAL	ALWAYS			
Reason for the Requested Procedure	0040,1002	USER	CONDITIONAL	ALWAYS			Reason for requesting this imaging procedure
Performed Procedure Code Sequence	0040,A372	USER	CONDITIONAL	ALWAYS			
>Code Value	0008,0100	USER	CONDITIONAL	ALWAYS			
>Coding Scheme Designator	0008,0102	USER	CONDITIONAL	ALWAYS			
>Code Meaning	0008,0104	USER	CONDITIONAL	ALWAYS			

Table A-12: Waveform Annotation Attributes Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Waveform Annotation Sequence	0040,B020	GENERATED	CONDITIONAL	ALWAYS			
>Referenced Waveform Channels	0040,A0B0	GENERATED	CONDITIONAL	ALWAYS			
>Annotation Group Number	0040,A180	GENERATED	CONDITIONAL	ALWAYS			
> Unformatted Text Value	0070,0006	GENERATED	CONDITIONAL	ALWAYS			
Measurement Units Code Sequence	0040,08EA	GENERATED	CONDITIONAL	ALWAYS			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS	UCUM		
>Coding Scheme Designator	0008,0102	GENERATED	CONDITIONAL	ALWAYS	1.4		
>Code Scheme Version		GENERATED	CONDITIONAL	ALWAYS	ms		
>Code Meaning	0008,0104	GENERATED	CONDITIONAL	ALWAYS	millisecond		
>Concept Name Code Sequence	0040,A043	GENERATED	CONDITIONAL	ALWAYS			
>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS	5.10.2.1-3"		
>Coding Scheme Designator	0008,0102	GENERATED	CONDITIONAL	ALWAYS	SCPECG		
>Code Scheme Version		GENERATED	CONDITIONAL	ALWAYS	1.3		
>Code Meaning	0008,0104	GENERATED	CONDITIONAL	ALWAYS	RR Interval		
>Referenced Waveform Channels	0040,A0B0	GENERATED	CONDITIONAL	ALWAYS	1 | 0		
>Annotation Group Number	0040,A180	GENERATED	CONDITIONAL	ALWAYS	0001H / 1		
>Numeric Value	0040,A30A	GENERATED	CONDITIONAL	ALWAYS	"0 "		

A.2.2 12-Lead ECG Waveform Storage SOP Class Instances Functional Group Macros – N/A

Not Applicable.

A.2.3 12-Lead ECG Waveform Storage SOP Class Instances Private Modules -N/A

Not Applicable.

A.2.4 12-Lead ECG Waveform Storage SOP Class Instances Coded Values – N/A

Not Applicable.

A.3 General ECG Waveform Storage SOP Class

Table A-12 defines the structure of General ECG Waveform Storage SOP Class.

Table A-13: ECG Waveform Storage SOP Class

IE	Module Name	Presence (Module)	Condition	Reference
Patient	Patient Module	ALWAYS		Table A-1
Study	General Study Module	ALWAYS		Table A-2
	Patient Study Module	ALWAYS		Table A-5
Series	General Series Module	ALWAYS		Table A-3
Equipment	General Equipment Module	ALWAYS		Table A-4
Waveform	SOP Common Module	ALWAYS		Table A-6
	Acquisition Context Module	ALWAYS		Table A-14
	Waveform Identification Module	ALWAYS		Table A-15
	Waveform Module	ALWAYS		Table A-16
	Waveform Annotation	CONDITIONAL		Table A-18
	Extended Attributes	CONDITIONAL		Table A-17

A.3.1   ECG Waveform Storage SOP Class Specific Modules

The following tables list Modules and Attributes specific for ECG Waveform

Table A-14. Acquisition Context Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Acquisition Context Sequence	0040,0555	GENERATED	ALWAYS	CONDITIONAL			
>Value Type	0040,A040	FIXED	ALWAYS	CONDITIONAL	CODE		
>Concept Name Code Sequence	0040,A043	FIXED	ALWAYS	ALWAYS			The "Name" component of the Name/Value pair.
>>Code Value	0008,0100	FIXED	CONDITIONAL	ALWAYS	5.4.5-33-1		
>>Coding Scheme Designator	0008,0102	FIXED	CONDITIONAL	ALWAYS	SCPECG		
>>Coding Scheme Version	0008,0103	FIXED	CONDITIONAL	ALWAYS	1.3		
>>Code Meaning	0008,0104	FIXED	CONDITIONAL	ALWAYS	Electrode Placement		

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>Concept Code Sequence	0040,A168	CONFIGURATION	CONDITIONAL	ALWAYS			This is the Value component of a Name/Value pair when the Concept implied by Concept Name Code Sequence (0040,A043) is a Coded Value.
>>Code Value	0008,0100	CONFIGURATION	CONDITIONAL	ALWAYS	5.4.5-33-1-1		
>>Coding Scheme Designator	0008,0102	CONFIGURATION	CONDITIONAL	ALWAYS	SCPECG		
>>Coding Scheme Version	0008,0103	CONFIGURATION	CONDITIONAL	ALWAYS	1.3		
>>Code Meaning	0008,0104	CONFIGURATION	CONDITIONAL	ALWAYS	Standard 12-Lead Positions		

Table A-15: Waveform Identification Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Content Date	0008,0023	GENERATED	ALWAYS	ALWAYS			
Acquisition Datetime	0008,002A	GENERATED	ALWAYS	ALWAYS			
Content Time	0008,0033	GENERATED	ALWAYS	ALWAYS			
Instance Number	0020,0013	FIXED	ALWAYS	ALWAYS	1		

Table A-16: Waveform Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Waveform Sequence	5400,0100	GENERATED	ALWAYS	ALWAYS			This will have 1 or 2 multiplex groups, one for rhythm data and one for median data
>Multiplex Group Time Offset	0018,1068	GENERATED	ALWAYS	ALWAYS			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
> Trigger Time Offset	0018,1069	GENERATED	ALWAYS	ALWAYS			
>Waveform Originality	003A,0004	FIXED	ALWAYS	ALWAYS			This will be "ORIGINAL" for the rhythm data and "DERIVED" for median data.
>Number of Waveform Channels	003A,0005	CONFIGURATION	ALWAYS	ALWAYS			
>Number of Waveform Samples	003A,0010	GENERATED	ALWAYS	ALWAYS			
>Sampling Frequency	003A,001A	GENERATED	ALWAYS	ALWAYS			
>Multiplex Group Label	003A,0020	FIXED	CONDITIONAL	ALWAYS			This is "RHYTHM" for the first group and "MEDIAN BEAT" for the second group.
>Channel Definition Sequence	003A,0200	GENERATED	ALWAYS	ALWAYS			There will be one item for each lead.
>>Channel Status	003A,0205	GENERATED	ALWAYS	ALWAYS			
>>Channel Source Sequence	003A,0208	GENERATED	ALWAYS	ALWAYS			Sequence of one or more Items which further qualify the Waveform Source. This will have one item for each lead.
>>>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS			This is the code for the lead
>>>Coding Scheme Designator	0008,0102	FIXED	CONDITIONAL	ALWAYS	SCPECG		
>>>Coding Scheme Version	0008,0103	FIXED	CONDITIONAL	ALWAYS	1.3		
>>>Code Meaning	0008,0104	GENERATED	CONDITIONAL	ALWAYS			This is the lead name.
>>Channel Sensitivity	003A,0210	GENERATED	CONDITIONAL	ALWAYS			Value will be different according to 500sps or 1000sps format of ECG for the report

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>>Channel Sensitivity Units Sequence	003A,0211	FIXED	CONDITIONAL	ALWAYS			
>>>Code Value	0008,0100	FIXED	CONDITIONAL	ALWAYS	uV		
>>>Coding Scheme Designator	0008,0102	FIXED	CONDITIONAL	ALWAYS	UCUM		
>>>Coding Scheme Version	0008,0103	FIXED	CONDITIONAL	ALWAYS	1.4		
>>>Code Meaning	0008,0104	FIXED	CONDITIONAL	ALWAYS	microvolt		
>>Channel Sensitivity Correction Factor	003A,0212	FIXED	CONDITIONAL	ALWAYS	1		
>>Channel Baseline	003A,0213	FIXED	CONDITIONAL	ALWAYS	0		
>>Channel Sample Skew	003A,0215	FIXED	CONDITIONAL	ALWAYS	0		
>>Waveform Bits Stored	003A,021A	GENERATED	ALWAYS	ALWAYS	16		
>>Filter Low Frequency	003A,0220	CONFIGURATION	CONDITIONAL	ALWAYS			
>>Filter High Frequency	003A,0221	CONFIGURATION	CONDITIONAL	ALWAYS			
>>Notch Filter Frequency	003A,0222	CONFIGURATION	CONDITIONAL	ALWAYS			
>Waveform Bits Allocated	5400,1004	GENERATED	ALWAYS	ALWAYS	16		
>Waveform Sample Interpretation	5400,1006	FIXED	ALWAYS	ALWAYS	SS		
>Waveform Data	5400,1010	GENERATED	ALWAYS	ALWAYS			Encoded data samples - channel multiplexed.

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Table A-17: Extended Attributes Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Visit Comments	0038,4000	USER	CONDITIONAL	ALWAYS			User-defined comments about the visit
Other Patient IDs	0010,1000	USER	CONDITIONAL	ALWAYS			
Reason for the Requested Procedure	0040,1002	USER	CONDITIONAL	ALWAYS			Reason for requesting this imaging procedure
Performed Procedure Code Sequence	0040,A372	USER	CONDITIONAL	ALWAYS			
>Code Value	0008,0100	USER	CONDITIONAL	ALWAYS			
>Coding Scheme Designator	0008,0102	USER	CONDITIONAL	ALWAYS			
>Code Meaning	0008,0104	USER	CONDITIONAL	ALWAYS			

Table A-18: Waveform Annotation Attributes Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Waveform Annotation Sequence	0040,B020	GENERATED	CONDITIONAL	ALWAYS			
>Referenced Waveform Channels	0040,A0B0	GENERATED	CONDITIONAL	ALWAYS			
>Annotation Group Number	0040,A180	GENERATED	CONDITIONAL	ALWAYS			
> Unformatted Text Value	0070,0006	GENERATED	CONDITIONAL	ALWAYS			
Measurement Units Code Sequence	0040,08EA	GENERATED	CONDITIONAL	ALWAYS			
>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS	UCUM		

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>Coding Scheme Designator	0008,0102	GENERATED	CONDITIONAL	ALWAYS	1.4		
>Code Scheme Version		GENERATED	CONDITIONAL	ALWAYS	ms		
>Code Meaning	0008,0104	GENERATED	CONDITIONAL	ALWAYS	millisecond		
>Concept Name Code Sequence	0040,A043	GENERATED	CONDITIONAL	ALWAYS			
>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS	5.10.2.1-3"		
>Coding Scheme Designator	0008,0102	GENERATED	CONDITIONAL	ALWAYS	SCPECG		
>Code Scheme Version		GENERATED	CONDITIONAL	ALWAYS	1.3		
>Code Meaning	0008,0104	GENERATED	CONDITIONAL	ALWAYS	RR Interval		
>Referenced Waveform Channels	0040,A0B0	GENERATED	CONDITIONAL	ALWAYS	1 | 0		
>Annotation Group Number	0040,A180	GENERATED	CONDITIONAL	ALWAYS	0001H / 1		
>Numeric Value	0040,A30A	GENERATED	CONDITIONAL	ALWAYS	"0 "		

A.3.2   ECG Waveform Storage SOP Class Functional Group Macro – N/A

Not Applicable

A.3.3   ECG Waveform Storage SOP Class Private Modules – N/A

Not Applicable

A.3.4   ECG Waveform Storage SOP Class Coded Values – N/A

Not Applicable

A.4 Encapsulated PDF Storage SOP Class

A.4.1 Encapsulated PDF Storage SOP Class Specific Module

Table A-17. Encapsulated PDF Storage SOP Class

IE	Module Name	Presence (Module)	Condition	Reference
Patient	Patient Module	ALWAYS		Table A-1
Study	General Study Module	ALWAYS		Table A-2
	Patient Study Module	CONDITIONAL		Table A-5
Equipment	General Equipment Module	ALWAYS		Table A-4
	SC Equipment Module	ALWAYS		Table A-18
Series	Encapsulated Document Series Module	ALWAYS		Table A-20
Encapsulated Document	SOP Common Module	ALWAYS		Table A-6
	Encapsulated Document Module	ALWAYS		Table A-19

Table A-17. SC Equipment Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Modality	0008,0060	GENERATED; MWL	CONDITIONAL	ALWAYS			
Conversion Type	0008,0064	GENERATED	ALWAYS	ALWAYS			

Table A-19. Encapsulated Document Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Content Date	0008,0023	GENERATED	ALWAYS	CONDITIONAL			
Acquisition DateTime	0008,002A	GENERATED	ALWAYS	CONDITIONAL			
Content Time	0008,0033	GENERATED	ALWAYS	CONDITIONAL			
Instance Number	0020,0013	GENERATED	ALWAYS	ALWAYS			
Image Laterality	0020,0062	GENERATED	CONDITIONAL	ALWAYS			
Burned In Annotation	0028,0301	GENERATED	ALWAYS	ALWAYS			
Concept Name Code Sequence	0040,A043	GENERATED	ALWAYS	CONDITIONAL			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Verification Flag	0040,A493	GENERATED	CONDITIONAL	ALWAYS			
Document Title	0042,0010	GENERATED	ALWAYS	CONDITIONAL			
Encapsulated Document	0042,0011	GENERATED	ALWAYS	ALWAYS			
MIME Type of Encapsulated Document	0042,0012	GENERATED	ALWAYS	ALWAYS			

Table A-20. Encapsulated Document Series Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Modality	0008,0060	GENERATED; MWL	ALWAYS	ALWAYS			
Referenced Performed Procedure Step Sequence	0008,1111	GENERATED	CONDITIONAL	ALWAYS			
>Referenced SOP Class UID	0008,1150	GENERATED	ALWAYS	ALWAYS			
>Referenced SOP Instance UID	0008,1155	GENERATED	ALWAYS	ALWAYS			
Series Instance UID	0020,000E	GENERATED	ALWAYS	ALWAYS			
Series Number	0020,0011	GENERATED	ALWAYS	ALWAYS			
Performed Protocol Code Sequence	0040,0260	GENERATED	ALWAYS	ALWAYS			
>Code Value	0008,0100	GENERATED	CONDITIONAL	ALWAYS			
>Coding Scheme Designator	0008,0102	GENERATED	CONDITIONAL	ALWAYS			
>Code Meaning	0008,0104	GENERATED	ALWAYS	ALWAYS			
Request Attributes Sequence	0040,0275	GENERATED	ALWAYS	ALWAYS			
>Requested Procedure Description	0032,1060	GENERATED	ALWAYS	ALWAYS			
>Requested Procedure Code Sequence	0032,1064	GENERATED	ALWAYS	ALWAYS			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>Scheduled Procedure Step Description	0040,0007	GENERATED	ALWAYS	ALWAYS			
>Scheduled Protocol Code Sequence	0040,0008	GENERATED	ALWAYS	ALWAYS			
> Scheduled Procedure Step ID	0040,0009	GENERATED	ALWAYS	ALWAYS			
>Requested Procedure ID	0040,1001	GENERATED	ALWAYS	ALWAYS			
Performed Procedure Step Start Date	0040,0244	GENERATED	CONDITIONAL	ALWAYS			
Performed Procedure Step Start Time	0040,0245	GENERATED	CONDITIONAL	ALWAYS			
Performed Procedure Step ID	0040,0253	GENERATED	CONDITIONAL	ALWAYS			
Performed Procedure Step Description	0040,0254	GENERATED	CONDITIONAL	ALWAYS			
Request Attributes Sequence	0040,0275	GENERATED	CONDITIONAL	ALWAYS			
Comments on the Performed Procedure Step	0040,0280	GENERATED	CONDITIONAL	ALWAYS			

Table A-21: Extended Attributes Module

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
Other Patient IDs	0010,1000	USER	CONDITIONAL	ALWAYS			
Acquisition Context Sequence	0040,0555	USER	CONDITIONAL	ALWAYS			
>Value Type	0040,A040	USER	CONDITIONAL	ALWAYS			
>Concept Name Code Sequence	0040,A043	USER	CONDITIONAL	ALWAYS			
>>Code Value	0008,0100	USER	CONDITIONAL	ALWAYS			
>>Coding Scheme Designator	0008,0102	USER	CONDITIONAL	ALWAYS			

Attribute Name	Tag	Source	Presence of Attribute	Presence of Value	Value	Conditions	Comments
>>Coding Scheme Version	0008,0103	USER	CONDITIONAL	ALWAYS			
>>Code Meaning	0008,0104	USER	CONDITIONAL	ALWAYS			

A.4.2   Encapsulated PDF Storage SOP Class Functional Group Macro – N/A

Not Applicable

A.4.3   Encapsulated PDF Storage SOP Class Private Modules – N/A

Not Applicable

A.4.4   Encapsulated PDF Storage SOP Class coded values – N/A

Not Applicable

A.5   SR IOD - N/A

Not Applicable

A.6   Basic Directory IOD -N/A

Not Applicable

A.7   Private IOD - N/A

Not Applicable

B   Structured Report Content Encoding – N/A

Not Applicable

C   Security Details

This section provides additional details about security features that are formally described in Section 8.

C.1   External Network Requirement Details

C.1.1   Basic Time Synchronization

CW5000/CW7000 supports SNTP (Simple NTP) as time client, to enable user needs to manually configure the IP address of SNTP server for time sync.

When no NTP Servers are available, the product uses the Operating system configured time.

C.1.2   Basic Network Address Management -

C.1.3   CW5000/CW7000 works as DHCP client.Application Configuration Management-N/A

Not Applicable

C.1.4   DNS Service Discovery – N/A

C.2   Users can configure DNS server manually or automatically get DNS server setting if DHCP is enabled.
   DICOM Security Profile Details

C.2.1   Online Electronic Storage Secure Use – N/A

Not applicable since CW5000/7000 does not support this profile.

C.2.2   Audit Trail Messages – N/A

Not applicable since CW5000/7000 does not support this profile.

C.2.3   Audit Trial Message Transmission Profile - SYSLOG - TLS – N/A

Not applicable since CW5000/7000 does not support this profile.

C.2.4   Audit Trial Message Transmission Profile - SYSLOG - UDP – N/A

Not applicable since CW5000/7000 does not support this profile.

C.2.5   Secure Transport Connection Details

CW5000/CW7000 supports only TLS 1.2.

CW5000/CW7000 not supports disabling of any cipher suites, the product is designed to support as many cipher suites as possible and the server can choose which to be enabled.

Table C.2.5 1 lists the secure transport connection profiles and cipher suites supported for TLS 1.2:

Table C.2.5 1: Secure Transport Connection Profiles and Cipher Suites

Profile	Cipher Suite	Default Preference Order (from 1=preferred to n=less preferred)
BCP 195 RFC 8996 TLS Secure Transport Connection Profile	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 (0xc02c)	1
	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (0xc030)	2
	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384 (0x009f)	3
	TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256 (0xcca9)	4
	TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256 (0xcca8)	5
	TLS_DHE_RSA_WITH_CHACHA20_POLY1305_SHA256 (0xccaa)	6
	TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 (0xc02b)	7
	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (0xc02f)	8
	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 (0x009e)	9
	TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 (0xc024)	10
	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 (0xc028)	11
	TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 (0x006b)	12
	TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 (0xc023)	13
	TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256 (0xc027)	14
	TLS_DHE_RSA_WITH_AES_128_CBC_SHA256 (0x0067)	15
	TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA (0xc00a)	16
	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA (0xc014)	17
	TLS_DHE_RSA_WITH_AES_256_CBC_SHA (0x0039)	18
	TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA (0xc009)	19

TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA (0xc013)	20
TLS_DHE_RSA_WITH_AES_128_CBC_SHA (0x0033)	21
TLS_RSA_WITH_AES_256_GCM_SHA384 (0x009d)	22
TLS_RSA_WITH_AES_128_GCM_SHA256 (0x009c)	23
TLS_RSA_WITH_AES_256_CBC_SHA256 (0x003d)	24
TLS_RSA_WITH_AES_128_CBC_SHA256 (0x003c)	25
TLS_RSA_WITH_AES_256_CBC_SHA (0x0035)	26
TLS_RSA_WITH_AES_128_CBC_SHA (0x002f)	27
TLS_EMPTY_RENEGOTIATION_INFO_SCSV (0x00ff)	28

Table C.2.5 2 lists the secure transport connection profiles and key exchange algorithms supported for TLS 1.2:

Table C.2.5 2: Secure Transport Connection Profiles and TLS 1.2 Key Exchange Algorithms

Profile	Cipher Suite	Default Preference Order (from 1=preferred to n=less preferred)
BCP 195 RFC 8996 TLS Secure Transport Connection Profile	ECDHE	1
	DHE	2
	RSA	3

Table C.2.5 3 lists the secure transport connection profiles and signature algorithms supported for TLS 1.2:

Table C.2.5 3: Secure Transport Connection Profiles and TLS 1.2 Signature Algorithms

Profile	Cipher Suite	Default Preference Order (from 1=preferred to n=less preferred)
BCP 195 RFC 8996 TLS Secure Transport Connection Profile	ECDSA	1
	RSA WITH AES	2
	RSA	3

Table C 2.5 4 describes the configurable parameters and behaviors supported by this product for the Secure Transport Connection:

Table C 2.5 5: Secure Transport Connection Configuration

Local Secure Transport Connection Configuration			
Parameter/Behavior	Configurable	Default Value	Comments
Common Secure Transport Connection parameters			
Port	See Section 6 Configuration		
Secure Connection	See Section 6 Configuration		
Certificate and Private Key	See Section 6 Configuration		
Trusted Root CA Certificate	See Section 6 Configuration		

C.2.6   Attribute Confidentiality Details – N/A

Not applicable since CW5000/7000 does not support this profile.

C.2.7   Digital Signature Details – N/A

Not applicable since CW5000/7000 does not support this profile.

C.2.8   Additional DICOM Security Profile Details – N/A

Not applicable since CW5000/7000 does not support an additional DICOM security profile.

D   Mapping of Attributes

D.1   Mapping Between Modality Worklist Instances and MPPS

Table D-1 describes the mapping of Attributes between Modality Worklist Instances and MPPS messages.

In the "Scenario" column the following Values are used:

In the "Value Source" columns, the following Values are used. The column cell may additionally contain an Attribute Tag if the value is copied from a different Attribute.

- GENERATED: The Value is generated by the system.
- SRC_INSTANCE: The Value is copied from previously created instances.
- MWL: The Value is copied from a Modality Worklist entry.
- USER: The Value is entered by the user.
- SCANNED: The Value is read from a barcode scanner or similar device.
- EMPTY: The Attribute is sent with a zero-length Value.

The "Destination" columns either contain TOP, if the Attribute is added to the top level Data Set of the Instance or contain the Attribute Tag of the Sequence the Attribute will be added to. The "Comments" column can be used to provide additional information regarding the Values added to the Instance or MPPS.

Table D-1: Mapping of Attributes from Modality Worklist to Instance and MPPS

Attribute Name in Image/MPPS	Tag	Scenario	Image		MPPS		Comments
			Value Source	Destination	Value Source	Destination	
Study Instance UID	(0020,000D)	SCHEDULED	MWL	TOP	SRC_INSTANCE	(0040,0270)	
		UNSCHEDULED	GENERATED	TOP	EMPTY	(0040,0270)	
		APPEND	SRC_INSTANCE	TOP	SRC_INSTANCE	(0040,0270)	
		GROUP	SYSTEM	TOP	SRC_INSTANCE	(0040,0270) [a]	[a] One item per SPS in (0040, 0270)
Accession Number	(0008,0050)	SCHEDULED	MWL	TOP	SRC_INSTANCE	(0040,0270)	
		UNSCHEDULED	EMPTY	TOP	EMPTY	(0040,0270)	
		APPEND	SRC_INSTANCE	TOP	SRC_INSTANCE	(0040,0270)	
		GROUP	MWL; EMPTY	TOP	MWL [b]	(0040,0270)	[a] If the Accession Number for

Attribute Name in Image/MPPS	Tag	Scenario	Image		MPPS		Comments
			Value Source	Destination	Value Source	Destination	
							all Requested Procedures is the same, use that in the Accession Number of the Instances. If different keep empty. (b) Copy Accession Number for each Requested Procedure into the item of the appropriate SPS
Requested Procedure ID	(0040,1001)	SCHEDULED	MWL	(0040,0275) (a) (0040,A370) (b)	SRC_INSTANCE	(0040,0270)	(a) for use in Image IODs) (b) for use in Evidence Documents
		UNSCHEDULED	N/A	N/A	EMPTY	(0040,0270)	
		APPEND	SRC_INSTANCE	(0040,0275) (a) (0040,A370) (b)	SRC_INSTANCE	(0040,0270)	(a) for use in Image IODs) (b) for use in Evidence Documents
		GROUP					
Study ID	(0020,0010)	SCHEDULED	MWL (0040,1001)	TOP	SRC_INSTANCE	TOP	(0040,1001) is Requested Procedure ID
		UNSCHEDULED	GENERATED	TOP	SRC_INSTANCE	TOP	
		APPEND	SRC_INSTANCE (0040,1001)	TOP	SRC_INSTANCE	TOP	(0040,1001) is Requested Procedure ID

E   Code Set Usage

Using SNOMED RT code, not yet transitioned to SNOMED CT code.

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