

# SIEMENS

## AXIOM Aristos<sup>®</sup> VB20

**AX**

### DICOM Conformance Statement

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# 1 Introduction

## 1.1 Overview

The Conformance Statement describes the DICOM interface for the Siemens AXIOM Aristos® <sup>a</sup> VB20 in terms of part 2 of [DICOM].

This introduction describes the application's implemented DICOM functionality in general terms.

## 1.2 Scope and Field

The AXIOM Aristos® VB20 is a “*syngo*®-speaking<sup>b</sup>” Imaging Modality or workstation. The AXIOM Aristos is designed to be integrated into an environment of medical DICOM-based devices. The AXIOM Aristos DICOM network implementation acts as SCU for the DICOM Storage, Storage Commitment, DICOM Print, DICOM Basic Worklist and Modality Performed Procedure Step Services. Verification is supported in SCU (only via Service environment) and SCP role.

## 1.3 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

## 1.4 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Siemens and non-Siemens equipment.
- Test procedures should be defined and tests should be performed by the user to validate the connectivity desired. DICOM itself and the conformance parts do not specify this.
- The standard will evolve to meet the users' future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.
- Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most recent product information.

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<sup>a</sup> AXIOM Aristos is a registered trademark of Siemens AG

<sup>b</sup> *syngo* is a registered trademark of Siemens AG

## 1.5 Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

|       |                                                    |
|-------|----------------------------------------------------|
| ACR   | American College of Radiology                      |
| AE    | DICOM Application Entity                           |
| ASCII | American Standard Code for Information Interchange |
| CR    | Computed Radiography                               |
| CSE   | Customer Service Engineer                          |
| DB    | Database                                           |
| DCS   | DICOM Conformance Statement                        |
| DX    | Digital X-Ray                                      |
| EXI   | Exposure Index                                     |
| IIDC  | Image-Intensifier Distortion Correction            |
| IOD   | DICOM Information Object Definition                |
| ISO   | International Standard Organization                |
| MWL   | Modality Worklist                                  |
| NEMA  | National Electrical Manufacturers Association      |
| O     | Optional Key Attribute                             |
| PDU   | DICOM Protocol Data Unit                           |
| R     | Required Key Attribute                             |
| RIS   | Radiology Information System                       |
| SCU   | DICOM Service Class User (DICOM client)            |
| SCP   | DICOM Service Class Provider (DICOM server)        |
| SOP   | DICOM Service-Object Pair                          |
| U     | Unique Key Attribute                               |

## 1.6 References

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2004

## 1.7 Structure

This Conformance Statement is subdivided into multiple Parts, which relate to individual documents needed to declare Conformance according to the requirements of "Part 2 - Conformance" of the DICOM Standard.

Those parts are:

- "Network Conformance Statement" for Network related Services
  - Verification - User/Provider
  - Storage - User
  - Storage Commitment - User
  - Basic Grayscale Print - User
  - Basic Worklist - User
  - Modality Performed Procedure Step - User
- A general Annex

## 2 Implementation Model Verification

The AXIOM Aristos DICOM Service Tool application requests Verification to verify the ability of a remote DICOM application on a remote node to respond to DICOM messages.

Responding to Verification requests from remote nodes is handled by the AXIOM Aristos DICOM network application.

### 2.1 Application Data Flow Diagram

The AXIOM Aristos DICOM network implementation acts as SCU and SCP for the C-ECHO DICOM network service. The product target Operating System is Windows XP.

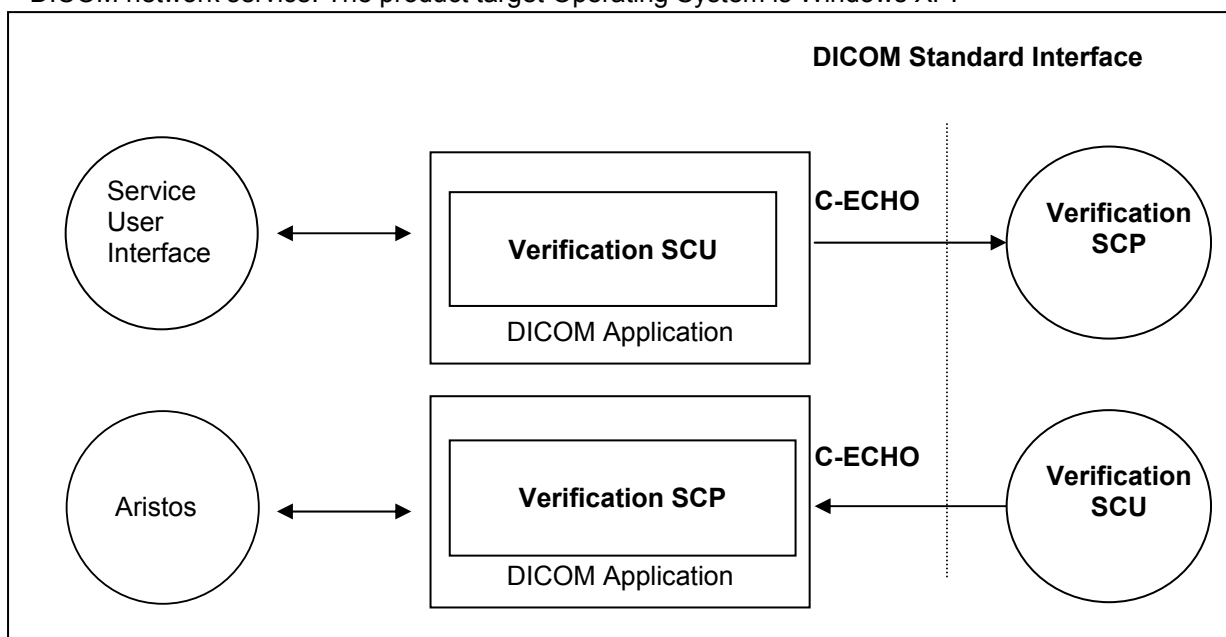


Figure 1: Application Data Flow Diagram - Verification SCU / SCP

### 2.2 Functional Definitions of Applications

The AXIOM Aristos DICOM Service Tool application opens an association when a “verification” of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

Verification requests will be processed and responded by the AXIOM Aristos.

### 2.3 Sequencing of Real-World Activities

Newly entered data have to be saved first, before a “verification” of these data is possible.

### 3 Application Entity Specification Verification

#### 3.1 Verification AE Specification

##### 3.1.1 Association Establishment Policies

###### 3.1.1.1 General

The AXIOM Aristos DICOM Service Tool application attempts to open an association for verification request whenever the “verification” function is activated during network configuration of a remote DICOM application.

The AXIOM Aristos DICOM application will accept association requests for verification.

The default PDU size used will be 256 KB.

###### 3.1.1.2 Number of Associations

The AXIOM Aristos DICOM Service Tool application initiates one association at a time to request verification.

The AXIOM Aristos DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

###### 3.1.1.3 Asynchronous Nature

The AXIOM Aristos DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

###### 3.1.1.4 Implementation Identifying Information

|                             |                            |
|-----------------------------|----------------------------|
| Implementation Class UID    | 1.3.12.2.1107.5.9.20000101 |
| Implementation Version Name | “SIEMENS_SWFVD31A”         |

#### 3.1.2 Association Initiation Policy

The AXIOM Aristos DICOM Service Tool application attempts to initiate a new association for

- DIMSE C-ECHO service operations.

##### 3.1.2.1 Associated Real-World Activity - Request Verification

###### 3.1.2.1.1 Associated Real-World Activity – Request Verification “verification”

The associated Real-World activity is a C-ECHO request initiated by Service and Configuration SW environment whenever “verification” is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open

association. If the C-ECHO Response from the remote Application contains a status other than "Success" this will be indicated in the service environment and the association is closed.

### 3.1.2.1.2 Proposed Presentation Contexts

The AXIOM Aristos DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table – Verification SCU |                   |                                                                                  |                                                                 |      |                      |
|-----------------------------------------------|-------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|----------------------|
| Abstract Syntax                               |                   | Transfer Syntax                                                                  |                                                                 | Role | Extended Negotiation |
| Name                                          | UID               | Name List                                                                        | UID List                                                        |      |                      |
| Verification                                  | 1.2.840.10008.1.1 | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |

### 3.1.2.1.3 SOP Specific Conformance – Verification SCU

The Application conforms to the definitions of the Verification SCU in accordance to the DICOM Standard.

## 3.1.3 Association Acceptance Policy

The AXIOM Aristos DICOM application attempts to accept a new association for

- DIMSE C-ECHO

### 3.1.3.1 Associated Real-World Activity - Receive Verification

#### 3.1.3.1.1 Associated Real-World Activity – Receiving Verification Requests from a Remote Node

The associated Real-World activity is a C-ECHO request initiated by a remote Application Entity. An association request for Verification will be accepted. Upon a C-ECHO request the AXIOM Aristos DICOM application will send a C-ECHO Response with status "Success" to the remote Application.

#### 3.1.3.1.2 Accepted Presentation Context – Receiving Verification

The AXIOM Aristos DICOM application will accept Presentation Contexts as shown in the following table:

| Presentation Context Table |                   |                                                                                  |                                                                 |      |           |
|----------------------------|-------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax            |                   | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                       | UID               | Name List                                                                        | UID List                                                        |      |           |
| Verification               | 1.2.840.10008.1.1 | Explicit VR Little Endian<br>Explicit VR Big Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2 | SCP  | None      |

### 3.1.3.1.3 SOP Specific Conformance – Verification

The Application conforms to the definitions of the Verification SCP in accordance to the DICOM Standard.

## 4 Implementation Model Storage

The AXIOM Aristos DICOM Application Entity originates associations for Storage of DICOM Composite Information Objects in Remote Application Entities.

### 4.1 Application Data Flow Diagram

The AXIOM Aristos DICOM network implementation acts as SCU for the C-STORE DICOM network service. The product target Operating System is Windows XP.

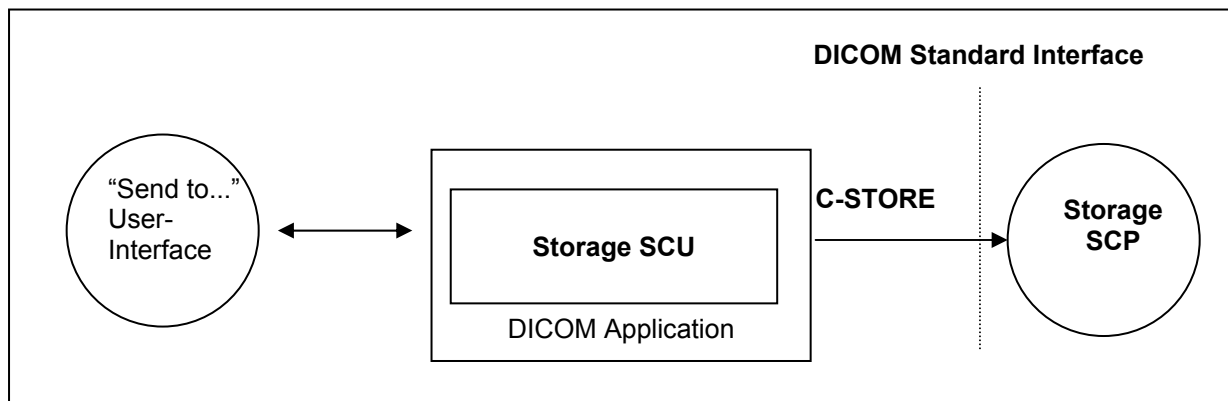


Figure 2: Application Data Flow Diagram – Storage SCU

### 4.2 Functional Definitions of Application Entities

The Storage SCU is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

### 4.3 Sequencing of Real-World Activities

not applicable

## 5 Application Entity Specification Storage

### 5.1 Storage AEs Specification

SIEMENS AXIOM Aristos DICOM application provides Standard Conformance to the following DICOM SOP Classes as an SCU:

| SOP Class Name                                         | SOP Class UID               |
|--------------------------------------------------------|-----------------------------|
| Computed <b>R</b> adiography Image Storage             | 1.2.840.10008.5.1.4.1.1.1   |
| Digital <b>X</b> -Ray Image Storage – for Presentation | 1.2.840.10008.5.1.4.1.1.1.1 |

SIEMENS AXIOM Aristos DICOM products provide Private Conformance to the following DICOM conform private SOP Classes as an SCU:

| SOP Class Name        | SOP Class UID       |
|-----------------------|---------------------|
| CSA Non-Image Storage | 1.3.12.2.1107.5.9.1 |

#### 5.1.1 Association Establishment Policies

##### 5.1.1.1 General

After starting a send job an association request is sent to the destination AE and upon successful negotiation of a Presentation Context the transfer is started.

The default PDU size used will be 256 KB.

##### 5.1.1.2 Number of Associations

The AXIOM Aristos DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

##### 5.1.1.3 Asynchronous Nature

The AXIOM Aristos DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

##### 5.1.1.4 Implementation Identifying Information

|                             |                            |
|-----------------------------|----------------------------|
| Implementation Class UID    | 1.3.12.2.1107.5.9.20000101 |
| Implementation Version Name | "SIEMENS_SWFVD31A"         |

## 5.1.2 Association Initiation Policy

If a send job is started AXIOM Aristos DICOM application attempts to initiate a new association for

- DIMSE C-STORE

service operations.

### 5.1.2.1 Associated Real-World Activity - Send

#### 5.1.2.1.1 Associated Real-World Activity – Send Image Objects to a Network Destination

The associated Real-World activity is a C-STORE request initiated by an internal daemon process triggered by a job with network destination. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. If the C-STORE Response from the remote Application contains a status other than “Success” or “Warning”, the association is aborted.

#### 5.1.2.1.2 Proposed Presentation Context – Send Images

The AXIOM Aristos DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table           |                             |                                                                                                               |                                                                                           |      |           |
|--------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------|-----------|
| Abstract Syntax                      |                             | Transfer Syntax                                                                                               |                                                                                           | Role | Ext. Neg. |
| Name                                 | UID                         | Name List                                                                                                     | UID List                                                                                  |      |           |
| Computed Radiography Image           | 1.2.840.10008.5.1.4.1.1.1   | JPEG Lossless, Process 14<br>Explicit VR Little Endian<br>Explicit VR Big Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2 | SCU  | None      |
| Digital X-Ray Image for presentation | 1.2.840.10008.5.1.4.1.1.1.1 | JPEG Lossless, Process 14<br>Explicit VR Little Endian<br>Explicit VR Big Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2 | SCU  | None      |
| CSA Non-Image                        | 1.3.12.2.1107.5.9.1         | Implicit VR Little Endian<br>Explicit VR Big Endian<br>Explicit VR Little Endian                              | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.2<br>1.2.840.10008.1.2.1                           | SCU  | None      |

Not all the listed transfer syntaxes will be proposed all the time. The contents of this list is configurable, e.g. it could be configured to contain only Implicit Little Endian.

The compression type JPEG lossless can be set in the Application Entity Properties configuration (storage checked). It can be reached via the Service-UI: Configuration / DICOM / Network nodes

#### 5.1.2.1.3 SOP specific Conformance to Storage SOP classes

The Application conforms to the definitions of the Storage SCU in accordance to the DICOM Standard. Depending on configuration the DICOM images created by AXIOM Aristos application conform to the DICOM CR IOD or DICOM DX - For Presentation definitions (Standard extended IODs).

For association and DIMSE level time-outs, please refer to Configuration section of this document.

## 5.1.2.1.3.1 Optional Attributes

Please see the related Image Object definition tables in the Annex for a list of all DICOM IOD attributes of type 2 and 3, which are encoded by the AXIOM Aristos application.

## 5.1.2.1.3.2 Specialized Information Object Definitions

The DICOM images created by AXIOM Aristos DICOM application contain additional private elements.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification!

Please see “A.3 Registry of DICOM Data Elements” in the Annex for a Data Dictionary of applied private IOD Attributes.

## 5.1.3 Association Acceptance Policy

Not applicable

## 6 Implementation Model Storage Commitment

The Storage Commitment service class defines an application-level class of service that facilitates the commitment to storage. It performs an additional task of commitment of composite objects apart from the network-based storage of images as defined by the Storage Service class. The AXIOM Aristos DICOM implementation supports the Storage Commitment Push Model as SCU.

### 6.1 Application Data Flow Diagram

The AXIOM Aristos DICOM network implementation acts as SCU for the Storage Commitment Push Model Service using the Storage Commitment Service Class. The product target Operating System is Windows XP.

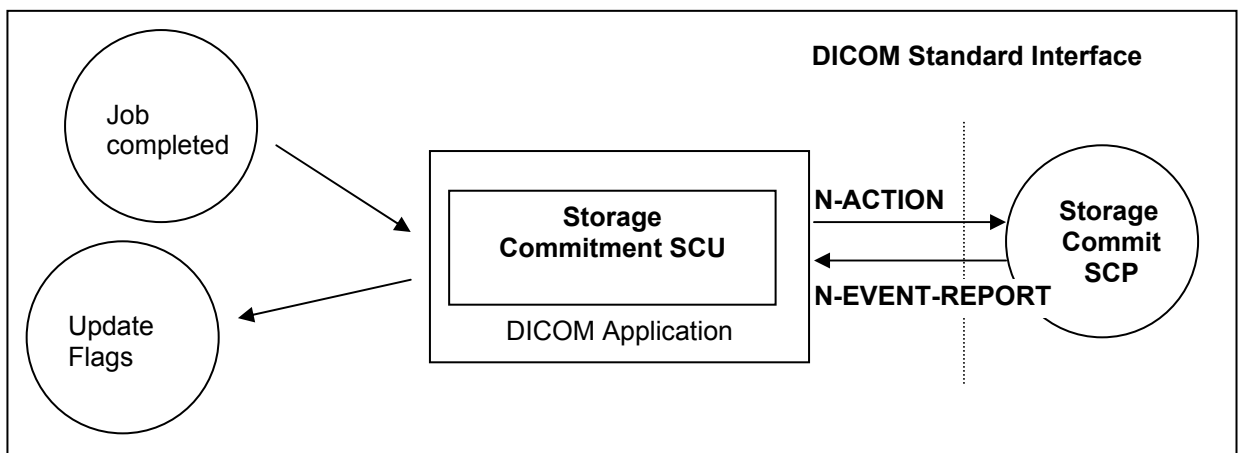


Figure 3: Application Data Flow Diagram – Storage Commitment SCU

### 6.2 Functional Definitions of Application Entities

With each successfully completed send job, the AXIOM Aristos DICOM Application will populate the Storage Commitment Push Model Action Information from the SOP Instances sent. Then a Storage Commit Request is triggered. Depending on configuration, the AXIOM Aristos DICOM application will keep the association open for responses with a configurable time-out, or closes the association and expects responses on a different association that has to be established by the remote Storage Commitment SCP.

The commitment status derived from the related trigger response will be indicated in the Status Flags of the related entity. It is possible to create triggers ("auto rules") from this event.

The Transaction UUIDs of the pending commitment request are kept "open" for a configurable amount in time (default: 1h). If the "open time" for a pending commitment request has elapsed w/o a related response from the provider, the Transaction UUID is removed and the related entities are indicated as "commit failed".

In any case, commitment will only be requested for previously and successfully sent images.

## **6.3 Sequencing of real World Activities**

The Storage Commitment trigger is automatically derived from the successful completion of a Send Job.

## 7 AE Specification Storage Commitment

### 7.1 Storage Commitment AE Specification

SIEMENS AXIOM Aristos DICOM application provides Standard Conformance to the following DICOM SOP Class as an SCU:

| SOP Class Name                | SOP Class UID        |
|-------------------------------|----------------------|
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 |

#### 7.1.1 Association Establishment Policies

##### 7.1.1.1 General

With a Send Job successfully completed, the DICOM application will generate a Storage Commitment Action Information that references all Instances of the processed job. The Commit Request is then sent over a single opened association. The AXIOM Aristos will wait for Status responses of the Storage Commitment Request. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a time-stamp, is kept. Depending on configuration, the association is closed when the configured time-out has elapsed or a response was received before. If the association is closed before a response was received, the response is then expected on a different association. Multiple Storage Commitment Requests can be pending.

The default PDU size used will be 256 KB.

##### 7.1.1.2 Number of Associations

The AXIOM Aristos DICOM application initiates several associations at a time, one for each destination to which a commit request is being processed in the active job queue list.

##### 7.1.1.3 Asynchronous Nature

The AXIOM Aristos DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

##### 7.1.1.4 Implementation Identifying Information

|                             |                            |
|-----------------------------|----------------------------|
| Implementation Class UID    | 1.3.12.2.1107.5.9.20000101 |
| Implementation Version Name | "SIEMENS_SWFVD31A"         |

#### 7.1.2 Association Initiation Policy

The AXIOM Aristos DICOM Application Entity acts as a Service Class User (SCU) for the

- Storage Commitment Push Model Service Class (to request commitment for storage of instances previously sent).

To do so, the AXIOM Aristos will issue a

- N-ACTION DIMSE to request commitment

### 7.1.2.1 Real-World Activity – Storage Commitment

#### 7.1.2.1.1 Associated Real-World Activity - Job Completed

The AXIOM Aristos Storage Commitment application sends the commit request (N-ACTION-RQ) message and waits for acceptance of this request (N-ACTION-RSP). After receiving this, the transaction is marked as “waiting”.

Depending on a configuration value, the association will then be closed or kept open. In the first case, there is another configurable timeout giving the number of hours (h) and minutes (m) (by default 1h:00m) to wait for the corresponding commit response (N-EVENT-REPORT). In the second case, this time is the (also configurable) time-out for the association. For both cases, if the commit response (N-EVENT-REPORT) does not arrive during the configured time, the transaction will be marked as failed. The AXIOM Aristos does not re-send objects from a failed Storage Commitment result in any case.

If the commit response (N-EVENT-REPORT) received has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”; In both cases, a message is shown to the user.

#### 7.1.2.1.2 Proposed Presentation Contexts - Job Completed

The AXIOM Aristos DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table    |                      |                                                                                  |                                                                 |      |           |
|-------------------------------|----------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax               |                      | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                          | UID                  | Name List                                                                        | UID List                                                        |      |           |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |

#### 7.1.2.1.3 SOP Specific Conformance Statement- Job Completed

The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the commitment request (N-ACTION primitive) invoked by the Storage Commitment SCU.

### 7.1.3 Association Acceptance Policy

The AXIOM Aristos DICOM Application Entity acts as a Service Class User (SCU) for the

- N-EVENT-REPORT DIMSE to receive a storage commitment response from a previous request if the SCP behavior requires a different association than the commit request.

### 7.1.3.1 Associated Real-World Activity - Commit SCU

#### 7.1.3.1.1 Associated Real-World Activity - Update Flags

The AXIOM Aristos Storage Commitment DICOM Application has sent a Storage Commitment Request and, being configured to receive response on a separate association, has closed the association and then gets an association request from the Storage Commitment SCP that wants to send the results. The AXIOM Aristos DICOM application will await Storage commitment Notification triggers. Any incoming Notification will be checked for validity, that is, if the related Transaction UID is still part of the Pending Request Queue.

If the Notification is valid, the Notification Event Information is evaluated and the related Instances marked with the related status. This status is propagated to the higher level information entities.

The Status Flags directly affected by Storage Commitment results and indicated in the different entities of the Patient Browser list can be one of

- “AC” or “SC” - Successful Commitment, A means archived to configured Archive destination, whereas S means sent to any other destination
- “Af” or “Sf” - Commitment failed.
- “A?” or “S?” - Commitment request is sent, response is pending.

In case of failure the user has to repeat the transfer of images to the Archive destination. Another Storage Commitment will be performed after sending is completed successfully.

#### 7.1.3.1.2 Accepted Presentation Contexts - Update Flags

The Siemens AXIOM Aristos DICOM application will accept Presentation Contexts as shown in the following table:

| Presentation Context Table    |                      |                                                                                  |                                                                 |      |           |
|-------------------------------|----------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax               |                      | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                          | UID                  | Name List                                                                        | UID List                                                        |      |           |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |

#### 7.1.3.1.3 SOP-specific Conformance Statement - Update Flags

If the Commitment response (N-EVENT-REPORT) received has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”; In both cases, a message is shown to the user.

The related status flags are set for the committed images in the local database.

The AXIOM Aristos DICOM application will NOT support the Storage Media File Set ID attributes.

## 8 Implementation Model Print

The Print Management Service Classes define an application-level class of services, which facilitate the printing of images on a hardcopy medium. The *syngo* DICOM print application supports the print management DIMSE services to act as SCU.

### 8.1 Application Data Flow Diagram

The *syngo* DICOM network implementation acts as SCU for the print management network service. The product target Operating System is Windows XP.

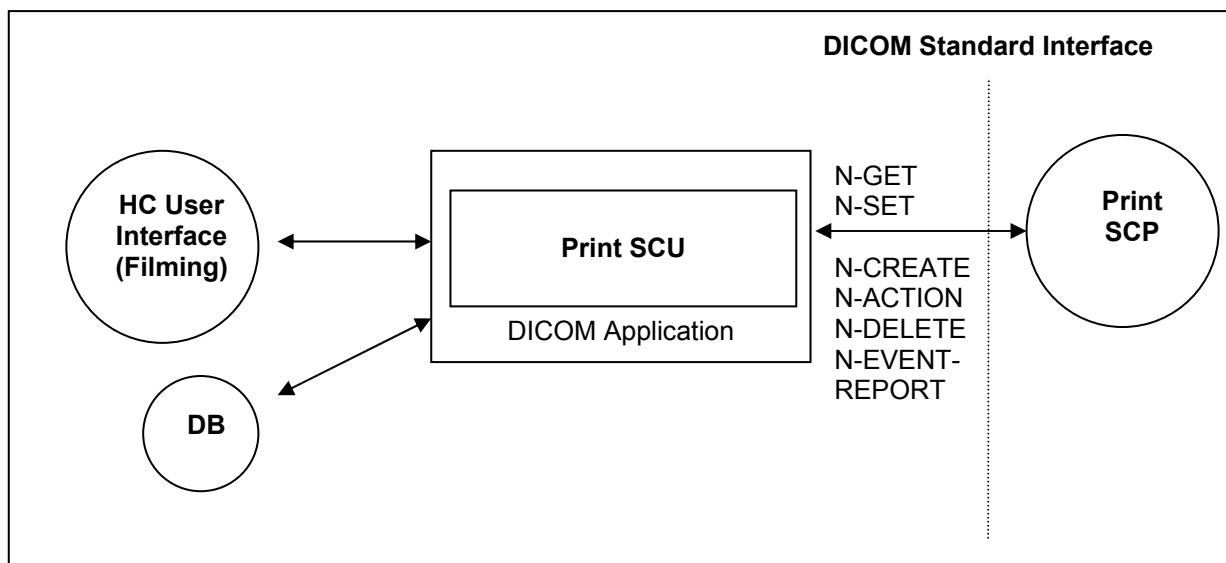


Figure 4: DICOM Application Data Flow Diagram – Print SCU

### 8.2 Functional Definition of Application Entities

The Print SCU is invoked by the user interface to setup film-sheet layout and whenever an image is ready to be printed on film. The Print SCU will hold and maintain all data needed to compile a complete film-sheet from the data (images, layout, configuration) received. Whenever a film-sheet is ready to print the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained, in order to intermediately store several film-sheets in case of resource problems on printer.

### 8.3 Sequencing of Real-World Activities

Not applicable

## 9 Application Entity Specification Print

### 9.1 Print Management AE Specification

The *syngo* print management SCU invokes print management DIMSE services to transfer images from the local AE to the remote SCP AE to print images with defined layout on a selected network-based DICOM hardcopy printer. This is done in a “full-page” print mode.

SIEMENS *syngo* DICOM products provide Standard Conformance to the following DICOM Print Management Meta SOP Classes as an SCU:

| SOP Class Name                                  | SOP Class UID          |
|-------------------------------------------------|------------------------|
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9  |
| - Basic Film Session SOP Class                  | 1.2.840.10008.5.1.1.1  |
| - Basic Film Box SOP Class                      | 1.2.840.10008.5.1.1.2  |
| - Basic Grayscale Image Box SOP Class           | 1.2.840.10008.5.1.1.4  |
| - Printer SOP Class                             | 1.2.840.10008.5.1.1.16 |
| Print Job SOP Class                             | 1.2.840.10008.5.1.1.14 |
| Presentation LUT SOP Class                      | 1.2.840.10008.5.1.1.23 |

#### 9.1.1 Association Establishment Policies

##### 9.1.1.1 General

Whenever a film is completely set up and printed by command or automatism, the job is prepared for processing. As soon as the queue is ready to process the job is activated. The related Print application will initiate an association to the print destination and process the printing of the related information.

The default PDU size used will be 256 KB.

##### 9.1.1.2 Number of Associations

The *syngo* DICOM Print application initiates one association at a time for each different print device configured.

##### 9.1.1.3 Asynchronous Nature

The *syngo* DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

#### 9.1.1.4 Implementation Identifying Information

|                             |                            |
|-----------------------------|----------------------------|
| Implementation Class UID    | 1.3.12.2.1107.5.9.20000101 |
| Implementation Version Name | "SIEMENS_SWFVD31A"         |

#### 9.1.2 Association Initiation Policy

Triggered by the Print job queue the Print Management SCU establishes an association by using the DICOM association services. With the help of the N-GET request for the Printer SOP Class the Status is determined before printing.

With no problem encountered with the N-CREATE/N-SET Services for the related Basic Print SOP Classes the film sheet is set up for printing and the image(s) is(are) transferred to the printer device.

After the last film is printed from queue, the Print application will leave open the association for another 60 seconds. If a new film job is ready for printing within this time limit, the job will be immediately processed over the still open association. If there is no new job, the association is closed if the time-out elapsed. This is done to optimize automated printing.

During the "idle-time" (no open association to printer) the Print application will issue a cyclic camera status request (using N-GET of Printer SOP Class) every 5 minutes.

##### 9.1.2.1 Associated Real-World Activity

##### 9.1.2.1.1 Associated Real-World Activity – Printing a Printer Job Queue Entry

Whenever the user prepares a film-sheet it is forwarded to the Printer Job queue. As soon as the associated Printer device is available the job is activated by opening an association to this device.

The film sheet is internally processed, converted to a Standard/1-1 page and then the page image is sent. Status is controlled by awaiting any N-EVENT message all through the transfer until the last image or film-sheet is sent.

If the response from the remote application contains a status other than Success or Warning the association is aborted.

##### 9.1.2.1.2 Proposed Presentation Context (Presentation Context Table)

The Siemens *syngo* DICOM Print application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table                      |                       |                                                                                  |                                                                 |      |           |
|-------------------------------------------------|-----------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax                                 |                       | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                                            | UID                   | Name List                                                                        | UID List                                                        |      |           |
| Basic Grayscale Print Management Meta SOP class | 1.2.840.10008.5.1.1.9 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |

| Presentation Context Table          |                        |                                                                                  |                                                                 |      |           |
|-------------------------------------|------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax                     |                        | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                                | UID                    | Name List                                                                        | UID List                                                        |      |           |
| Basic film session SOP class        | 1.2.840.10008.5.1.1.1  | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |
| Basic Film Box SOP class            | 1.2.840.10008.5.1.1.2  | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |
| Basic Grayscale Image Box SOP class | 1.2.840.10008.5.1.1.4  | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |
| Printer SOP class                   | 1.2.840.10008.5.1.1.16 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |
| Print Job SOP class                 | 1.2.840.10008.5.1.1.14 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |
| Presentation LUT SOP class          | 1.2.840.10008.5.1.1.23 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |

### 9.1.2.1.3 SOP specific Conformance Statement – Meta SOP Classes

The *syngo* DICOM print management SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class.

The application uses a configuration platform to define the properties of the connected DICOM SCP, e.g.:

- maximum number of print jobs in the queue
- maximum number of print copies
- supported film sizes of the connected DICOM SCP
- supported film formats of the DICOM SCP
- lookup table definition.

The printing is only suspended in the case of a failure return status of the SCP.

#### 9.1.2.1.3.1 Basic Film Session SOP class

The Basic Film Session information object definition describes all the user-defined parameters, which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes and that are printed on one hardcopy printer.

The *syngo* DICOM print management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE, N-DELETE

The Basic Film Session SOP Class N-CREATE-RQ (SCU) uses the following attributes:

| Attribute Name   | Tag         | Usage SCU | Supported Values                 |
|------------------|-------------|-----------|----------------------------------|
| Number of Copies | (2000,0010) | U         | 1                                |
| Medium Type      | (2000,0030) | U         | BLUE FILM<br>CLEAR FILM<br>PAPER |
| Film Destination | (2000,0040) | U         | MAGAZINE<br>PROCESSOR            |

The number of Copies sent to the DICOM Printer is always 1, the job is sent n times for n copies.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Session – see below:

| Attribute Name             | Tag                          | Source of Information                                              |
|----------------------------|------------------------------|--------------------------------------------------------------------|
| Requested SOP Instance UID | (0000,1000)<br>→ (0000,1001) | Affected SOP Instance UID of N-CREATE-RSP<br>on Basic Film Session |

The N-DELETE-RQ on the Basic Film Session SOP Class is used to remove the complete Basic Film Session SOP Instance hierarchy.

The Basic Film Session SOP class interprets the following status codes (from N-CREATE-RSP, N-DELETE-RSP messages):

| Service Status | Meaning                                                                      | Error Codes |
|----------------|------------------------------------------------------------------------------|-------------|
| Failed         | Film session SOP instances hierarchy does not contain film box SOP instances | C600        |
|                | Unable to create print job, print queue is full                              | C601        |
|                | Image size is larger than images box size                                    | C603        |
| Warning        | Memory allocation not supported                                              | B600        |
|                | Film session printing is not supported                                       | B601        |
|                | Film box does not contain image box (empty page)                             | B602        |
| Success        | Film belonging to the film session are accepted for printing                 | 0000        |

#### 9.1.2.1.3.2 Basic Film Box SOP class

The Basic Film Box information object definition describes all the user-defined parameter of one film of the film session. The Basic Film Box information description defines the presentation parameters, which are common for all images on a given sheet of film.

The Basic Film Box refers to one or more Image Boxes.

Supported Service Elements as SCU are:

- N-CREATE
- N-ACTION
- N-DELETE

The Basic Film Box SOP class N-CREATE-RQ message uses the following attributes (the actual values for each attribute depend on DICOM printer configuration within the *syngo* DICOM print management SCU):

| Attribute Name                       | Tag         | Usage SCU | Supported Values                                                                       |
|--------------------------------------|-------------|-----------|----------------------------------------------------------------------------------------|
| Image Display Format                 | (2010,0010) | M         | STANDARD\1,1                                                                           |
| Referenced Film Session Sequence     | (2010,0500) | M         |                                                                                        |
| > Referenced SOP Class UID           | (0008,1150) | M         | 1.2.840.10008.5.1.1.1                                                                  |
| > Referenced SOP Instance UID        | (0008,1155) | M         |                                                                                        |
| Film Orientation                     | (2010,0040) | M         | PORTRAIT                                                                               |
| Film Size ID                         | (2010,0050) | M         | 8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN,, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM |
| Magnification Type                   | (2010,0060) | M         | BILINEAR, CUBIC, NONE, REPLICATE                                                       |
| Border Density                       | (2010,0100) | U         | BLACK, WHITE                                                                           |
| Max Density                          | (2010,0130) | U         | 0 < Value                                                                              |
| Min Density                          | (2010,0120) | U         | 0 < Value < 50                                                                         |
| Illumination                         | (2010,015E) | U         | 0 < Value<br>Required if Presentation LUT is present.                                  |
| Reflective Ambient Light             | (2010,0160) | U         | 0 < Value<br>Required if Presentation LUT is present.                                  |
| Referenced Presentation LUT Sequence | (2050,0500) | U         |                                                                                        |

The N-CREATE-RSP message from the Print SCP includes the Referenced Image Box Sequence with SOP Class/Instance UID pairs that will be kept internally to be further used for the subsequent Basic Image Box SOP Class N-SET-RQ messages.

When all Image Boxes (including parameters) for the film-sheet have been set, the *syngo* DICOM print manager will issue a N-ACTION-RQ message with the SOP Instance UID of the Basic Film Box and the Action Type ID of 1.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Box - see below:

| Attribute Name             | Tag                          | Source of Information                                       |
|----------------------------|------------------------------|-------------------------------------------------------------|
| Requested SOP Instance UID | (0000,1000)<br>→ (0000,1001) | Affected SOP Instance UID of N-CREATE-RSP on Basic Film Box |

The Basic Film Box SOP class interprets the following status codes:

| Service Status | Meaning                                                                 | Error Codes |
|----------------|-------------------------------------------------------------------------|-------------|
| Failure        | Unable to create print job, print queue is full                         | C602        |
|                | Image size is larger than images box size                               | C603        |
| Warning        | Film box does not contain image box (empty page)                        | B603        |
|                | Requested MinDensity or MaxDensity outside of Printer's operating range | B605        |
| Success        | Film accepted for printing                                              | 0000        |

### 9.1.2.1.3.3 Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information describes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Grayscale Image Box SOP Class uses only the N-SET-RQ with the following attributes:

| Attribute Name                 | Tag         | Usage SCU | Supported Values |
|--------------------------------|-------------|-----------|------------------|
| Image Position                 | (2020,0010) | M         | 1                |
| BASIC Grayscale Image Sequence | (2020,0110) | M         |                  |
| > Samples per Pixel            | (0028,0002) | M         | 1                |
| > Photometric Interpretation   | (0028,0004) | M         | MONOCHROME2      |
| > Rows                         | (0028,0010) | M         |                  |
| > Columns                      | (0028,0011) | M         |                  |
| > Pixel Aspect Ratio           | (0028,0034) | M         |                  |
| > Bits Allocated               | (0028,0100) | M         | 8 or 16          |
| > Bits Stored                  | (0028,0101) | M         | 8 or 12          |
| > High Bit                     | (0028,0102) | M         | 7 or 11          |
| > Pixel Representation         | (0028,0103) | M         | 0                |
| > Pixel Data                   | (7FE0,0010) | M         |                  |

The Grayscale Image Box SOP class interprets the following status codes:

| Service Status | Meaning                                                                 | Error Codes |
|----------------|-------------------------------------------------------------------------|-------------|
| Failure        | Image contains more pixel than printer can print in Image Box           | C603        |
|                | Insufficient memory in printer to store the image                       | C605        |
| Warning        | Requested MinDensity or MaxDensity outside of Printer's operating range | B605        |
| Success        |                                                                         | 0000        |

#### 9.1.2.1.3.4 Presentation LUT SOP Class

The objective of the Presentation LUT is to realize image hardcopy printing tailored for specific modalities, applications and user preferences.

The output of the Presentation LUT is Presentation Values (P-Values). P-Values are approximately related to human perceptual response. They are intended to facilitate common input for hardcopy. P-Values are intended to be independent of the specific class or characteristics of the hardcopy device.

The Presentation LUT SOP Class uses only the N-CREATE-RQ with the following attributes:

| Attribute Name         | Tag         | Usage SCU | Supported Values |
|------------------------|-------------|-----------|------------------|
| Presentation LUT Shape | (2050,0020) | U         | IDENTITY         |

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and is used for later requests on the Basic Film Box (N-CREATE-RQ) and on the Presentation LUT (N-DELETE-RQ) - see below:

| Attribute Name             | Tag                          | Source of Information                                         |
|----------------------------|------------------------------|---------------------------------------------------------------|
| Requested SOP Instance UID | (0000,1000)<br>→ (0000,1001) | Affected SOP Instance UID of N-CREATE-RSP on Presentation LUT |

The Presentation LUT SOP class interprets the following status codes:

| Service Status | Meaning                                                                                                                                    | Error Codes |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Warning        | Requested MinDensity or MaxDensity outside of HCD's operating range. HCD will use its respective minimum or maximum density value instead. | B605        |

| Service Status | Meaning                               | Error Codes |
|----------------|---------------------------------------|-------------|
| Success        | Presentation LUT successfully created | 0000        |

#### 9.1.2.1.3.5Printer SOP Class

The Printer SOP Class is the possibility to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronous way.

It can directly ask the Printer (SCP) for its status or receive Events from the Printer asynchronously:

- N-GET as SCU
- N-EVENT-REPORT as SCU In both cases the following information is supported:

Used Printer N-EVENT Report attributes

| Event-type Name | Event | Attributes          | Tag         | Usage SCU |
|-----------------|-------|---------------------|-------------|-----------|
| Normal          | 1     |                     |             |           |
| Warning         | 2     | Printer Status Info | (2110,0020) | U         |
| Failure         | 3     | Printer Status Info | (2110,0020) | U         |

Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

| Attribute Name      | Tag         | Usage SCP | Supported Values                 |
|---------------------|-------------|-----------|----------------------------------|
| Printer Status      | (2110,0010) | M         | NORMAL, FAILURE, WARNING         |
| Printer Status Info | (2110,0020) | M         | See tables in Annex for details. |

**Note:** For a detailed description on how *syngo* reacts on different printer status messages, please refer to the Annex section "DICOM Print SCU – detailed status displays".

#### 9.1.2.1.3.6Print Job SOP Class

The Print Job SOP Class is the possibility to monitor the execution of the print process.

The *syngo* DICOM Print Management application supports the optional N-EVENT-REPORT DIMSE Service to receive the changes of the Print Job Status in an asynchronous way.

It can receive Events from the Print SCP asynchronously

Note: *syngo* does not support receiving N-EVENT from camera during print sessions; normally this is configurable in the camera.

N-EVENT-REPORT The following information is supported:

Used Print Job N-EVENT Report attributes

| Event-type Name | Event | Attributes            | Tag         | Usage SCU                                              |
|-----------------|-------|-----------------------|-------------|--------------------------------------------------------|
| Normal          | 1     | Execution Status Info | (2100,0030) | U                                                      |
|                 |       | Print Job ID          | (2100,0010) | --<br>(Print Queue Management SOP Class not supported) |
|                 |       | Film Session Label    | (2000,0050) | U                                                      |
|                 |       | Printer Name          | (2110,0030) | U                                                      |
| Printing        | 2     | Execution Status Info | (2100,0030) | U                                                      |

| Event-type Name | Event | Attributes            | Tag         | Usage SCU                                                 |
|-----------------|-------|-----------------------|-------------|-----------------------------------------------------------|
|                 |       | Print Job ID          | (2100,0010) | --<br>(Print Queue Management<br>SOP Class not supported) |
|                 |       | Film Session Label    | (2000,0050) | U                                                         |
|                 |       | Printer Name          | (2110,0030) | U                                                         |
| Done            | 3     | Execution Status Info | (2100,0030) | U                                                         |
|                 |       | Print Job ID          | (2100,0010) | --<br>(Print Queue Management<br>SOP Class not supported) |
|                 |       | Film Session Label    | (2000,0050) | U                                                         |
|                 |       | Printer Name          | (2110,0030) | U                                                         |
| Failure         | 4     | Execution Status Info | (2100,0030) | U                                                         |
|                 |       | Print Job ID          | (2100,0010) | --<br>(Print Queue Management<br>SOP Class not supported) |
|                 |       | Film Session Label    | (2000,0050) | U                                                         |
|                 |       | Printer Name          | (2110,0030) | U                                                         |

**Note:** For a detailed description on how *syngo* reacts on different printer status messages, please refer to the Annex section "DICOM Print SCU – detailed status displays".

### 9.1.3 Association Acceptance Policy

Not applicable

## 10 Implementation Model Worklist

The Basic Worklist Management Service class defines an application-level class of service that facilitates the transfer of worklists from the information system to the imaging modality. The worklist is queried by the AE and supplies the SCU with the scheduled tasks, which have to be performed on the modality. The AXIOM Aristos DICOM worklist application supports the worklist service as SCU.

### 10.1 Application Data Flow Diagram

The AXIOM Aristos DICOM network implementation acts as SCU for the Basic Worklist Service using the Modality Worklist SOP Class. The product target Operating System is Windows XP.

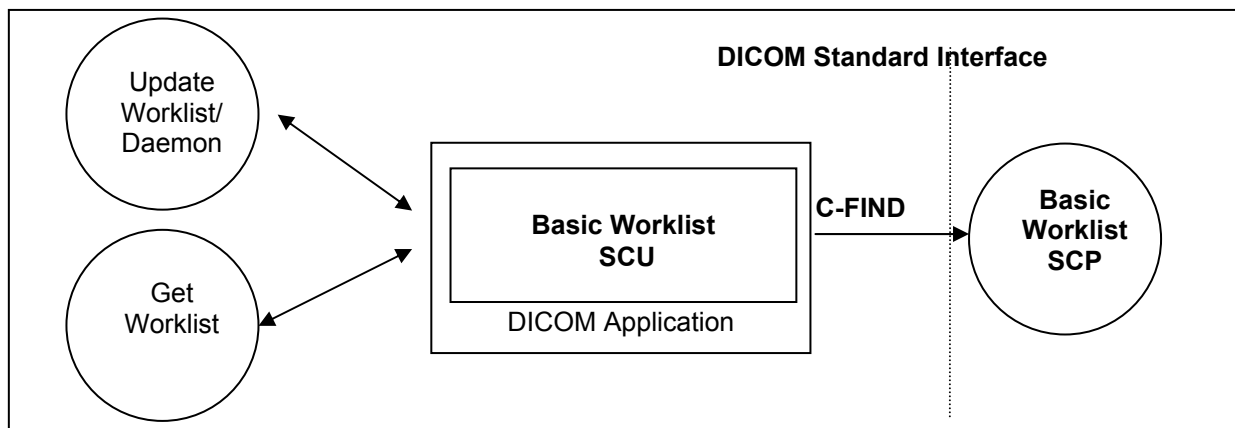


Figure 5: AXIOM Aristos Application Flow Diagram – Basic Worklist SCU

### 10.2 Functional Definitions of Application Entities

The worklist SCU ("broad query") is invoked from the patient browser user interface or by timer to request the worklist from a remote Information System (Modality Worklist Class SCP). This is done to perform a match to the internal worklist query keys specified in the C-Find DIMSE service issued for the Modality Worklist Model.

The worklist SCP responds to the C-FIND query and scheduled imaging service requests (scheduled procedure steps) and patient demographic information will be downloaded from the information system to the AXIOM Aristos modality. All information retrieved will be hold in the scheduling database for usage during Patient registration procedure.

Furthermore the patient based Query dialog from the patient browser allows to enter specific matching criteria ("narrow query") for the issue worklist query. With the response data the Patient Registration dialog can be populated according availability within the worklist response identifier.

## 10.3 Sequencing of Real-World Activities

The “narrow” (interactive) Worklist Query requires that sufficient matching keys or a unique matching key are/is entered before the query is issued. Only then a single response can be expected to complete the registration dialog.

## 11 Application Entity Specification Worklist

### 11.1 Modality Worklist Service AE Specification

The Modality Worklist SCU (patient registration in conjunction with the network application) requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database.

The AXIOM Aristos DICOM network implementation acts as SCU for the Basic Worklist Service using the Modality Worklist SOP Class:

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

#### 11.1.1 Association Establishment Policies

##### 11.1.1.1 General

It is possible to configure a cyclic update of the modality scheduler database through a background worklist request with date/time and modality information.

In addition the user can request worklist update with "Update Worklist". No duplicate entries will be added in the Scheduler DB. Entries are uniquely identified by the Study Instance UID (0020,000D) for the Requested Procedure and the SPS ID (0040,0009) in the SPS Sequence (0040,0100).

An interactive worklist query can be issued with search criteria entered in the patient based Query dialog from the patient browser.

The default PDU size used will be 256 KB.

##### 11.1.1.2 Number of Associations

The AXIOM Aristos DICOM application initiates one association at a time to query worklist entry data.

##### 11.1.1.3 Asynchronous Nature

The AXIOM Aristos DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

##### 11.1.1.4 Implementation Identifying Information

|                             |                            |
|-----------------------------|----------------------------|
| Implementation Class UID    | 1.3.12.2.1107.5.9.20000101 |
| Implementation Version Name | "SIEMENS_SWFVD31A"         |

**11.1.2 Association Initiation Policy**

The network application will cyclically query the worklist and by request of patient registration interface. Ever then it establishes an association by using the DICOM association services. During association establishment the negotiation of SOP classes to exchange the capabilities of the SCU and the SCP is not supported.

The following DIMSE-C operation is supported as SCU:

- C-FIND

**11.1.2.1 Real-World Activity****11.1.2.1.1 Associated Real-World Activity - Query (Update) Worklist**

A network application will perform worklist queries with the C-FIND request at regular intervals. In addition it can be triggered by immediate request. The received worklist items will be compared with the contents of the local scheduler database. New items will be inserted into scheduler database.

After each broad-query, all RP/SPS that were canceled or rescheduled to another modality at the RIS will be automatically removed from the Scheduler DB if:

1. the Examination of this procedure has not been started or finished yet, and
2. the corresponding configuration item "Automatic removal of canceled/rescheduled Request" was checked in the Service UI under DICOM HIS/RIS Node.

No automatic clean up of the scheduler DB is performed after a Patient base Query since the worklist received does not give the complete list of all currently scheduled procedures for the modality.

**11.1.2.1.2 Proposed Presentation Contexts**

The AXIOM Aristos DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table                |                        |                                                                                  |                                                                 |      |           |
|-------------------------------------------|------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax                           |                        | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                                      | UID                    | Name List                                                                        | UID List                                                        |      |           |
| Modality Worklist Information Model- FIND | 1.2.840.10008.5.1.4.31 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |

### 11.1.2.1.3 SOP Specific Conformance Statement

#### 11.1.2.1.3.1 Search Key Attributes of the Worklist C-FIND

The AXIOM Aristos DICOM worklist SCU supports "broad worklist queries" with all required search keys. The following tables describe the "broad query" search keys that the SCU supports.

| Attribute Name                       | Tag         | Matching Key Type | Query Value                                                 |
|--------------------------------------|-------------|-------------------|-------------------------------------------------------------|
| <b>Scheduled Procedure Step</b>      |             |                   |                                                             |
| Scheduled Procedure Step Sequence    | (0040,0100) | R                 |                                                             |
| >Scheduled Station AE Title          | (0040,0001) | R                 | <own AET> or <zero-length> <sup>a</sup>                     |
| >Scheduled Procedure Step Start Date | (0040,0002) | R                 | <act. Date> or range from UI <sup>b</sup>                   |
| >Scheduled Procedure Step Start Time | (0040,0003) | R                 | "000000.000000-235959.000000" or range from UI <sup>b</sup> |
| >Modality                            | (0008,0060) | R                 | <own Modality> or <zero-length> <sup>a</sup>                |

#### 11.1.2.1.3.2 Return Key Attributes of the Worklist C-FIND

The AXIOM Aristos DICOM worklist SCU supports worklist queries with return key attributes of all types. The following tables describe the return keys that the SCU supports.

An "x" in the **UI** column will indicate the attribute is visualized when browsing the Worklist results with Patient Browser and/or during Patient Registration. The Patient Browser display is additionally influenced by the related Browser configuration.

A DICOM attribute tag in the **IOD** column will indicate that the related attribute is included into the SOP Instances of the IODs created during processing of this worklist request.

A DICOM attribute tag in the **MPPS** column will indicate that the related attribute is included into the SOP Instances of the MPPS objects created during processing of this worklist request. ( See also the tables "Attributes used for the Performed Procedure Step N-CREATE" and "Attributes used for the Performed Procedure Step N-SET".)

| Attribute Name                         | Tag         | Return Key Type | UI | IOD                      | MPPS                     |
|----------------------------------------|-------------|-----------------|----|--------------------------|--------------------------|
| <b>SOP Common</b>                      |             |                 |    |                          |                          |
| Specific Character Set                 | (0008,0005) | 1C              | -  | (0008,0005)              | (0008,0005)              |
| <b>Scheduled Procedure Step</b>        |             |                 |    |                          |                          |
| Scheduled Procedure Step Sequence      | (0040,0100) | 1               |    |                          |                          |
| >Modality                              | (0008,0060) | 1               | x  | (0008,0060) <sup>c</sup> | (0008,0060)              |
| >Requested Contrast Agent              | (0032,1070) | 2C              | x  |                          |                          |
| >Scheduled Station AE Title            | (0040,0001) | 1               | x  |                          |                          |
| >Scheduled Procedure Step Start Date   | (0040,0002) | 1               | x  |                          |                          |
| >Scheduled Procedure Step Start Time   | (0040,0003) | 1               | x  |                          |                          |
| >Scheduled Procedure Step End Date     | (0040,0004) | 3               | -  |                          |                          |
| >Scheduled Procedure Step End Time     | (0040,0005) | 3               | -  |                          |                          |
| >Scheduled Performing Physician's Name | (0040,0006) | 1               | x  | (0008,1050) <sup>d</sup> | (0008,1050) <sup>d</sup> |

<sup>a</sup> It depends on user configuration (Options->Configuration->Patient Registration) if the "own AET" or "Modality" is provided or not. Use the "HIS/RIS" tab card for configuration.

<sup>b</sup> It depends on user configuration (Options->Configuration->Patient Registration) if the actual Date with a full time range or an interactive input dialog for date/time specification is used.

<sup>c</sup> "Modality" in IOD is taken from system configuration (CR or DX)

<sup>d</sup> "Scheduled Performing Physician's Name" is taken as default for "Performing Physician's Name"

| Attribute Name                                 | Tag         | Return Key Type | UI | IOD                                     | MPPS                                    |
|------------------------------------------------|-------------|-----------------|----|-----------------------------------------|-----------------------------------------|
| >Scheduled Procedure Step Description          | (0040,0007) | 1C              | x  | (0040,0007)<br>(0040,0254) <sup>a</sup> | (0040,0007)<br>(0040,0254) <sup>a</sup> |
| >Scheduled Protocol Code Sequence <sup>b</sup> | (0040,0008) | 1C              | -  | (0040,0008)                             | (0040,0008)<br>(0040,0260) <sup>c</sup> |
| >>Code Value                                   | (0008,0100) | 1C              | x  |                                         |                                         |
| >>Coding Scheme Designator                     | (0008,0102) | 1C              | x  |                                         |                                         |
| >>Coding Scheme Version                        | (0008,0103) | 3               | x  |                                         |                                         |
| >>Code Meaning                                 | (0008,0104) | 3               | x  |                                         |                                         |
| >Scheduled Procedure Step ID                   | (0040,0009) | 1               | x  | (0040,0009)<br>(0040,0253) <sup>d</sup> | (0040,0009)<br>(0040,0253) <sup>d</sup> |
| >Scheduled Station Name                        | (0040,0010) | 2               | x  |                                         |                                         |
| >Scheduled Procedure Step Location             | (0040,0011) | 2               | x  |                                         | (0040,0243) <sup>e</sup>                |
| >Pre-Medication                                | (0040,0012) | 2C              | x  |                                         |                                         |
| >Scheduled Procedure Step Status               | (0040,0020) | 3               | x  |                                         |                                         |
| >Comments on the Scheduled Procedure Step      | (0040,0400) | 3               | -  |                                         |                                         |
| <b>Requested Procedure</b>                     |             |                 |    |                                         |                                         |
| Referenced Study Sequence <sup>f</sup>         | (0008,1110) | 2               | -  | (0008,1110)                             | (0008,1110)                             |
| >Referenced SOP Class UID                      | (0008,1150) | 1C              | -  |                                         |                                         |
| >Referenced SOP Instance UID                   | (0008,1155) | 1C              | -  |                                         |                                         |
| Study Instance UID                             | (0020,000D) | 1               | -  | (0020,000D)                             | (0020,000D)                             |
| Requested Procedure Description                | (0032,1060) | 1C              | x  | (0032,1060)                             | (0032,1060)                             |
| Requested Procedure Code Sequence <sup>f</sup> | (0032,1064) | 1C              | -  | (0008,1032) <sup>g</sup><br>(0032,1064) | (0008,1032) <sup>g</sup>                |
| >Code Value                                    | (0008,0100) | 1C              | x  |                                         |                                         |
| >Coding Scheme Designator                      | (0008,0102) | 1C              | x  |                                         |                                         |
| >Coding Scheme Version                         | (0008,0103) | 3               | x  |                                         |                                         |
| >Code Meaning                                  | (0008,0104) | 3               | x  |                                         |                                         |
| Requested Procedure ID                         | (0040,1001) | 1               | x  | (0040,1001)<br>(0020,0010) <sup>h</sup> | (0040,1001)<br>(0020,0010) <sup>h</sup> |
| Reason for the Requested Procedure             | (0040,1002) | 3               | -  |                                         |                                         |
| Requested Procedure Priority                   | (0040,1003) | 2               | x  |                                         |                                         |
| Patient Transport Arrangements                 | (0040,1004) | 2               | -  |                                         |                                         |
| Requested Procedure Location                   | (0040,1005) | 3               | -  |                                         |                                         |
| Confidentiality Code                           | (0040,1008) | 3               | -  |                                         |                                         |
| Reporting Priority                             | (0040,1009) | 3               | -  |                                         |                                         |
| Names of intended Recipients of Results        | (0040,1010) | 3               | -  | (0008,1048) <sup>i</sup>                |                                         |
| Requested Procedure Comments                   | (0040,1400) | 3               | x  |                                         |                                         |
| <b>Imaging Service Request</b>                 |             |                 |    |                                         |                                         |
| Accession Number                               | (0008,0050) | 2               | x  | (0008,0050)                             | (0008,0050)                             |
| Referring Physician's Name                     | (0008,0090) | 2               | x  | (0008,0090)                             |                                         |
| Requesting Physician                           | (0032,1032) | 2               | x  | (0032,1032)<br>(0008,1048) <sup>j</sup> |                                         |
| Requesting Service                             | (0032,1033) | 3               | x  | (0032,1033)                             |                                         |
| Reason for the Imaging Service Request         | (0040,2001) | 3               | -  |                                         |                                         |

<sup>a</sup> "Scheduled Procedure Step Description" is taken as default for "Performed Procedure Step Description"

<sup>b</sup> Uses universal sequence match

<sup>c</sup> "Scheduled Protocol Code Sequence" is taken as default for "Performed Protocol Code Sequence"

<sup>d</sup> "Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID"

<sup>e</sup> "Scheduled Procedure Step Location" is taken as default for "Performed Location"

<sup>f</sup> Uses universal sequence match

<sup>g</sup> "Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence"

<sup>h</sup> "Requested Procedure ID" is taken as default for "Study ID"

<sup>i</sup> "Names of intended Recipients of Results" are added to the list of "Physician(s) of Record"

<sup>j</sup> "Requesting Physician" is added to the list of "Physician(s) of Record"

| Attribute Name                                             | Tag         | Return Key Type | UI | IOD         | MPPS        |
|------------------------------------------------------------|-------------|-----------------|----|-------------|-------------|
| Issuing Date of Imaging Service Request                    | (0040,2004) | 3               | -  |             |             |
| Issuing Time of Imaging Service Request                    | (0040,2005) | 3               | -  |             |             |
| Placer Order Number / Imaging Service Request <sup>a</sup> | (0040,2016) | 3               | -  |             | (0040,2016) |
| Filler Order Number / Imaging Service Request <sup>b</sup> | (0040,2017) | 3               | -  |             | (0040,2017) |
| Order entered by ...                                       | (0040,2008) | 3               | -  |             |             |
| Order Enterer's location                                   | (0040,2009) | 3               | -  |             |             |
| Order Callback Phone Number                                | (0040,2010) | 3               | -  |             |             |
| Imaging Service Request Comments                           | (0040,2400) | 3               | x  |             |             |
| <b>Visit Identification</b>                                |             |                 |    |             |             |
| Institution Name                                           | (0008,0080) | 3               | x  | (0008,0080) |             |
| Institution Address                                        | (0008,0081) | 3               | -  | (0008,0081) |             |
| Admission ID                                               | (0038,0010) | 2               | x  |             |             |
| Issuer of Admission ID                                     | (0038,0011) | 3               | -  |             |             |
| <b>Visit Status</b>                                        |             |                 |    |             |             |
| Current Patient Location                                   | (0038,0300) | 2               | x  |             |             |
| <b>Visit Relationship</b>                                  |             |                 |    |             |             |
| Referenced Study Sequence <sup>c</sup>                     | (0008,1110) | 3               | -  | (0008,1110) | (0008,1110) |
| >Referenced SOP Class UID                                  | (0008,1150) | 1C              | -  |             |             |
| >Referenced SOP Instance UID                               | (0008,1155) | 1C              | -  |             |             |
| Referenced Patient Sequence <sup>c</sup>                   | (0008,1120) | 2               | -  | (0008,1120) | (0008,1120) |
| >Referenced SOP Class UID                                  | (0008,1150) | 1C              | -  |             |             |
| >Referenced SOP Instance UID                               | (0008,1155) | 1C              | -  |             |             |
| <b>Visit Admission</b>                                     |             |                 |    |             |             |
| Referring Physician's Name                                 | (0008,0090) | 2               | x  | (0008,0090) |             |
| Admitting Diagnoses Description                            | (0008,1080) | 3               | x  | (0008,1080) |             |
| <b>Patient Identification</b>                              |             |                 |    |             |             |
| Patient's Name                                             | (0010,0010) | 1               | x  | (0010,0010) | (0010,0010) |
| Patient ID                                                 | (0010,0020) | 1               | x  | (0010,0020) | (0010,0020) |
| Other Patient IDs                                          | (0010,1000) | 3               | x  | (0010,1000) |             |
| Other Patient Names                                        | (0010,1001) | 3               | x  | (0010,1001) |             |
| <b>Patient Demographic</b>                                 |             |                 |    |             |             |
| Patient's Birth Date                                       | (0010,0030) | 2               | x  | (0010,0030) | (0010,0030) |
| Patient's Sex                                              | (0010,0040) | 2               | x  | (0010,0040) | (0010,0040) |
| Patient's Size                                             | (0010,1020) | 3               | x  | (0010,1020) |             |
| Patient's Weight                                           | (0010,1030) | 2               | x  | (0010,1030) |             |
| Patient's Address                                          | (0010,1040) | 3               | x  | (0010,1040) |             |
| Military Rank                                              | (0010,1080) | 3               | x  | (0010,1080) |             |
| Ethnic Group                                               | (0010,2160) | 3               | x  | (0010,2160) |             |
| Patient Comments                                           | (0010,4000) | 3               | x  | (0010,4000) |             |
| Patient Data Confidentiality Constraint Description        | (0040,3001) | 2               | -  | (0040,3001) |             |
| <b>Patient Medical</b>                                     |             |                 |    |             |             |
| Medical Alerts                                             | (0010,2000) | 2               | x  | (0010,2000) |             |
| Contrast Allergies                                         | (0010,2110) | 2               | x  | (0010,2110) |             |
| Pregnancy Status                                           | (0010,21C0) | 2               | x  | (0010,21C0) |             |
| Smoking Status                                             | (0010,21A0) | 3               | x  | (0010,21A0) |             |
| Last Menstrual Date                                        | (0010,21D0) | 3               | x  | (0010,21D0) |             |
| Additional Patient History                                 | (0010,21B0) | 3               | x  | (0010,21B0) |             |
| Special Needs                                              | (0038,0050) | 2               | x  | (0038,0050) |             |

<sup>a</sup> Old tag (0040,2006) is retired and not used.<sup>b</sup> Old tag (0040,2007) is retired and not used.<sup>c</sup> Uses universal sequence match

| Attribute Name                         | Tag         | Return Key Type | UI | IOD         | MPPS |
|----------------------------------------|-------------|-----------------|----|-------------|------|
| Patient State                          | (0038,0500) | 2               | x  | (0038,0500) |      |
| <b>Patient Relationship</b>            |             |                 |    |             |      |
| Referenced Study Sequence <sup>c</sup> | (0008,1110) | 3               | -  |             |      |
| >Referenced SOP Class UID              | (0008,1150) | 1C              | -  |             |      |
| >Referenced SOP Instance UID           | (0008,1155) | 1C              | -  |             |      |

#### 11.1.2.1.4 Associated Real-World Activity – Get Worklist

With "Get Worklist" in the patient based Worklist Query dialog, the entered attributes are used to form a worklist request identifier. With the response data the Patient Registration dialog can be updated to register an examination. The response data are additionally placed in the scheduler database

#### 11.1.2.1.5 Proposed Presentation Contexts – Get Worklist

This Real-World Activity will propose the same Presentation Contexts as with "Update Worklist". Please see table in section 11.1.2.1.2.

#### 11.1.2.1.6 SOP Specific Conformance – Get Worklist

##### 11.1.2.1.6.1 Search Key Attributes of the Worklist C-FIND

The AXIOM Aristos DICOM worklist SCU supports "narrow worklist queries" with all required search keys. The following tables describe the "narrow query" search keys that the SCU supports.

| Attribute Name                         | Tag         | Matching Key Type | Query Value                    |
|----------------------------------------|-------------|-------------------|--------------------------------|
| <b>Scheduled Procedure Step</b>        |             |                   |                                |
| Scheduled Procedure Step Sequence      | (0040,0100) | R                 |                                |
| >Scheduled Performing Physician's Name | (0040,0006) | R                 | input from UI or <zero-length> |
| <b>Requested Procedure</b>             |             |                   |                                |
| Requested Procedure ID                 | (0040,1001) | O                 | input from UI or <zero-length> |
| <b>Imaging Service Request</b>         |             |                   |                                |
| Accession Number                       | (0008,0050) | O                 | input from UI or <zero-length> |
| Referring Physician's Name             | (0008,0090) | O                 | input from UI or <zero-length> |
| <b>Visit Status</b>                    |             |                   |                                |
| Current Patient Location               | (0038,0300) | O                 | input from UI or <zero-length> |
| <b>Patient Identification</b>          |             |                   |                                |
| Patient's Name                         | (0010,0010) | R                 | input from UI or <zero-length> |
| Patient ID                             | (0010,0020) | R                 | input from UI or <zero-length> |

It is configurable to use additionally the search keys from the broad query ("Modality", "Scheduled Station AE Title", "Scheduled Procedure Step Start Date" and "Scheduled Procedure Step Start Time").

##### 11.1.2.1.6.2 Return Key Attributes of the Worklist C-FIND

Same list as for "Update Worklist". Please see table in section 11.1.2.1.3.2.

## 11.1.2.1.6.3 Status Codes of the Worklist C-FIND

The worklist SCU interprets following status codes:

| Service Status | Meaning                                                                                                                              | Error Codes | Related Fields             |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|
| Refused        | Out of Resources                                                                                                                     | A700        | (0000,0902)                |
| Failed         | Identifier does not match SOP Class                                                                                                  | A900        | (0000,0901)<br>(0000,0902) |
|                | Unable to process                                                                                                                    | Cxxx        | (0000,0901)<br>(0000,0902) |
| Cancel         | Matching terminated due to Cancel request                                                                                            | FE00        | None                       |
| Success        | Matching is complete - No final Identifier is supplied                                                                               | 0000        | None                       |
| Pending        | Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys          | FF00        | Identifier                 |
|                | Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier | FF01        | Identifier                 |

## 12 Implementation Model MPPS

The Modality Performed Procedure Step Service class defines an application-level class of service that facilitates the transfer of procedure, billing and radiation dose information from the imaging modality to the information system. The Performed Procedure Step is created and set by the AE and supplies the SCP with the information about a real-world procedure that is performed on the modality. The AXIOM Aristos DICOM Modality Performed Procedure Step application supports the MPPS service as SCU.

### 12.1 Application Data Flow Diagram

The AXIOM Aristos DICOM network implementation acts as SCU for the Modality Performed Procedure Step SOP Class. The product target Operating System is Windows XP.

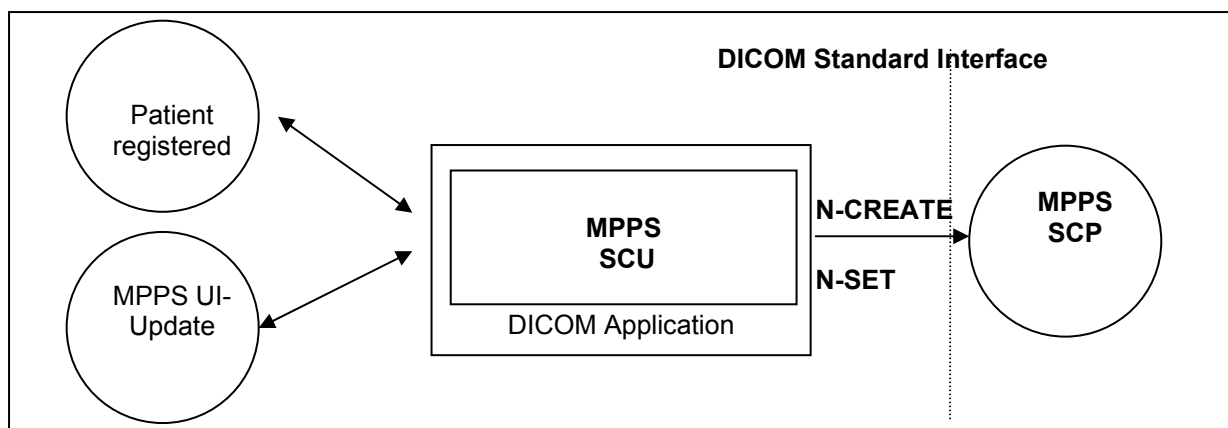


Figure 6: AXIOM Aristos Application Flow Diagram – MPPS SCU

### 12.2 Functional Definitions of Application Entities

With registering a Patient (i.e. a Scheduled Procedure Step from Worklist), the AXIOM Aristos DICOM application will create a MPPS Instance and communicate it to the MPPS SCP.

It is configurable to set the states of all related MPPS to "Completed" when a patient is closed. Furthermore a manual update can be performed with the AXIOM Aristos MPPS user interface. DICOM application will no longer allow updates on the related MPPS Instance when the state is set to "Completed" or "Discontinued".

The AXIOM Aristos will support creation of "unscheduled cases" by allowing MPPS Instances to be communicated for locally registered Patients.

## 13 AE Specification MPPS

### 13.1 Modality Performed Procedure Step AE Specification

The Modality Performed Procedure Step SCU (Patient Registration and MPPS UI) provides information about a performed real-world Procedure to a remote SCP (Information System).

SIEMENS AXIOM Aristos DICOM products provide Standard Conformance to the following DICOM SOP Class as an SCU:

| SOP Class Name                    | SOP Class UID           |
|-----------------------------------|-------------------------|
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 |

#### 13.1.1 Association Establishment Policies

##### 13.1.1.1 General

The creation of MPPS Instance is done automatically by AXIOM Aristos whenever a patient is registered for image acquisition through the Patient Registration dialog.

Further updates on the MPPS data can be done interactively from the related MPPS user interface. The MPPS “Complete” or “Discontinued” states can only be set from user interface.

The default PDU size used will be 256 KB.

##### 13.1.1.2 Number of Associations

The AXIOM Aristos DICOM application initiates one association at a time to create or set MPPS instance.

##### 13.1.1.3 Asynchronous Nature

The AXIOM Aristos DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

##### 13.1.1.4 Implementation Identifying Information

|                             |                            |
|-----------------------------|----------------------------|
| Implementation Class UID    | 1.3.12.2.1107.5.9.20000101 |
| Implementation Version Name | “SIEMENS_SWFVD31A”         |

#### 13.1.2 Association Initiation Policy

The AXIOM Aristos DICOM Application Entity acts as a Service Class User (SCU) for the

- Modality Performed Procedure Step Service Class (to notify a RIS about status of a procedure while it is performed).

To do so, the AXIOM Aristos will issue a

- N-CREATE DIMSE according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET DIMSE to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

### 13.1.2.1 Real World Activity

#### 13.1.2.1.1 Associated Real-World Activity - Patient registered

A patient is registered by the Patient Registration “Exam” action. From this event the trigger to create a MPPS Instance is derived. The related Instance is then immediately communicated to the configured RIS system. An association is established and the MPPS Instance is sent.

#### 13.1.2.1.2 Proposed Presentation Contexts - Patient registered

The AXIOM Aristos DICOM application will propose Presentation Contexts as shown in the following table:

| Presentation Context Table        |                         |                                                                                  |                                                                 |      |           |
|-----------------------------------|-------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-----------|
| Abstract Syntax                   |                         | Transfer Syntax                                                                  |                                                                 | Role | Ext. Neg. |
| Name                              | UID                     | Name List                                                                        | UID List                                                        |      |           |
| Modality Performed Procedure Step | 1.2.840.10008.3.1.2.3.3 | Implicit VR Little Endian<br>Explicit VR Little Endian<br>Explicit VR Big Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.2 | SCU  | None      |

#### 13.1.2.1.3 SOP Specific Conformance Statement- Patient registered

##### 13.1.2.1.3.1 Attributes used for the Performed Procedure Step N-CREATE

The Siemens AXIOM Aristos DICOM Modality Performed Procedure Step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed (i.e. the patient is registered). The N-CREATE message is sent when the examination is started with successful registration of the patient data. The following table describes the supported attributes of a N-CREATE message.

| Attribute Name                               | Tag         | Type | Value                     |
|----------------------------------------------|-------------|------|---------------------------|
| <b>SOP Common</b>                            |             |      |                           |
| Specific Character Set                       | (0008,0005) | 1C   | from MWL or created       |
| <b>Performed Procedure Step Relationship</b> |             |      |                           |
| Scheduled Step Attribute Sequence            | (0040,0270) | 1    |                           |
| >Study Instance UID                          | (0020,000D) | 1    | from MWL or created       |
| >Referenced Study Sequence                   | (0008,1110) | 2    | from MWL or <zero-length> |
| >>Referenced SOP Class UID                   | (0008,1150) | 1C   |                           |
| >>Referenced SOP Instance UID                | (0008,1155) | 1C   |                           |
| >Accession Number                            | (0008,0050) | 2    | from MWL or user input    |
| >Placer Order Number/Imaging Service Request | (0040,2016) | 3    | from MWL or <zero-length> |
| >Filler Order Number/Imaging Service Request | (0040,2017) | 3    | from MWL or <zero-length> |
| >Requested Procedure ID                      | (0040,1001) | 2    | from MWL or user input    |
| >Requested Procedure Description             | (0032,1060) | 2    | from MWL or <zero-length> |
| >Scheduled Procedure Step ID                 | (0040,0009) | 2    | from MWL or <zero-length> |
| >Scheduled Procedure Step Description        | (0040,0007) | 2    | from MWL or <zero-length> |

| Attribute Name                                        | Tag         | Type | Value                                                  |
|-------------------------------------------------------|-------------|------|--------------------------------------------------------|
| >Scheduled Protocol Code Sequence                     | (0040,0008) | 2    | from MWL or <zero-length>                              |
| >>Code Value                                          | (0008,0100) | 1C   |                                                        |
| >>Coding Scheme Designator                            | (0008,0102) | 1C   |                                                        |
| >>Coding Scheme Version                               | (0008,0103) | 3    |                                                        |
| >>Code Meaning                                        | (0008,0104) | 3    |                                                        |
| Patient's Name                                        | (0010,0010) | 2    | from MWL or user input                                 |
| Patient ID                                            | (0010,0020) | 2    | from MWL or user input                                 |
| Patient's Birth Date                                  | (0010,0030) | 2    | from MWL or user input                                 |
| Patient's Sex                                         | (0010,0040) | 2    | from MWL or user input                                 |
| Referenced Patient Sequence                           | (0008,1120) | 2    | from MWL or <zero-length>                              |
| >Referenced SOP Class UID                             | (0008,1150) | 1C   |                                                        |
| >Referenced SOP Instance UID                          | (0008,1155) | 1C   |                                                        |
| <b>Performed Procedure Step Information</b>           |             |      |                                                        |
| Performed Procedure Step ID                           | (0040,0253) | 1    | From SPS ID or created                                 |
| Performed Station AE Title                            | (0040,0241) | 1    | own AE Title                                           |
| Performed Station Name                                | (0040,0242) | 2    | own hostname                                           |
| Performed Location                                    | (0040,0243) | 2    | from SPS location or <zero-length>                     |
| Performed Procedure Step Start Date                   | (0040,0244) | 1    | created                                                |
| Performed Procedure Step Start Time                   | (0040,0245) | 1    | created                                                |
| Performed Procedure Step Status                       | (0040,0252) | 1    | "IN PROGRESS"                                          |
| Performed Procedure Step Description                  | (0040,0254) | 2    | from SPS Description or <zero-length>                  |
| Performed Procedure Type Description                  | (0040,0255) | 2    | <zero-length>                                          |
| Procedure Code Sequence                               | (0008,1032) | 2    | from Requested Procedure Code or <zero-length>         |
| >Code Value                                           | (0008,0100) | 1C   |                                                        |
| >Coding Scheme Designator                             | (0008,0102) | 1C   |                                                        |
| >Coding Scheme Version                                | (0008,0103) | 3    |                                                        |
| >Code Meaning                                         | (0008,0104) | 3    |                                                        |
| Performed Procedure Step End Date                     | (0040,0250) | 2    | <zero-length>                                          |
| Performed Procedure Step End Time                     | (0040,0251) | 2    | <zero-length>                                          |
| Comments on the Performed Procedure Steps             | (0040,0280) | 3    | <zero-length>                                          |
| <b>Image Acquisition Results</b>                      |             |      |                                                        |
| Modality                                              | (0008,0060) | 1    | CR or DX                                               |
| Study ID                                              | (0020,0010) | 2    | from Requested Procedure ID or created                 |
| Performed Protocol Code Sequence                      | (0040,0260) | 2    | from Scheduled Protocol Code Sequence or <zero-length> |
| >Code Value                                           | (0008,0100) | 1C   |                                                        |
| >Coding Scheme Designator                             | (0008,0102) | 1C   |                                                        |
| >Coding Scheme Version                                | (0008,0103) | 3    |                                                        |
| >Code Meaning                                         | (0008,0104) | 3    |                                                        |
| Performed Series Sequence                             | (0040,0340) | 2    |                                                        |
| >Performing Physician's Name                          | (0008,1050) | 2C   | from MWL or user input                                 |
| >Protocol Name                                        | (0018,1030) | 1C   | from organ program                                     |
| >Operator's Name                                      | (0008,1070) | 2C   | User input                                             |
| >Series Instance UID                                  | (0020,000E) | 1C   | created                                                |
| >Series Description                                   | (0008,103E) | 2C   | <zero-length>                                          |
| >Retrieve AE Title                                    | (0008,0054) | 2C   | <zero-length>                                          |
| >Referenced Image Sequence                            | (0008,1140) | 2C   | <zero-length>                                          |
| >Referenced Non-Image Composite SOP Instance Sequence | (0040,0220) | 2C   | <zero-length>                                          |
| <b>Radiation Dose</b>                                 |             |      |                                                        |
| Anatomic Structure, Space or Region Sequence          | (0008,2229) | 3    | <zero-length>                                          |
| Total Time of Fluoroscopy                             | (0040,0300) | 3    | <zero-length>                                          |
| Total Number of Exposures                             | (0040,0301) | 3    | <zero-length>                                          |

| Attribute Name                              | Tag         | Type | Value         |
|---------------------------------------------|-------------|------|---------------|
| Distance Source to Detector                 | (0018,1110) | 3    | <zero-length> |
| Distance Source to Entrance                 | (0040,0306) | 3    | <zero-length> |
| Entrance Dose                               | (0040,0302) | 3    | <zero-length> |
| Exposed Area                                | (0040,0303) | 3    | <zero-length> |
| Image Area Dose Product                     | (0018,115E) | 3    | <zero-length> |
| Comments on Radiation Dose                  | (0040,0310) | 3    | <zero-length> |
| <b>Billing and Material Management Code</b> |             |      |               |
| Billing Procedure Step Sequence             | (0040,0320) | 3    | <zero-length> |
| Film Consumption Sequence                   | (0040,0321) | 3    |               |
| >Number of Films                            | (2100,0170) | 3    | <zero-length> |
| >Medium Type                                | (2000,0030) | 3    | <zero-length> |
| >Film Size ID                               | (2010,0050) | 3    | <zero-length> |
| Billing Supplies and Devices Sequence       | (0040,0324) | 3    |               |
| >Billing Item Sequence                      | (0040,0296) | 3    | <zero-length> |
| >Quantity Sequence                          | (0040,0293) | 3    |               |
| >>Quantity                                  | (0040,0294) | 3    | <zero-length> |
| >>Measuring Units Sequence                  | (0040,0295) | 3    | <zero-length> |

### 13.1.2.1.3.2 Status Codes of the Performed Procedure Step N-CREATE

The Performed Procedure Step SCU interprets following status codes:

| Service Status | Meaning                 | Error Codes (0000.0900) |
|----------------|-------------------------|-------------------------|
| Failure        | Processing Failure      | 0110                    |
|                | No such attribute       | 0105                    |
|                | Invalid attribute value | 0106                    |
|                | Duplicate SOP Instance  | 0111                    |
|                | No such SOP Instance    | 0112                    |
|                | No such SOP Class       | 0118                    |
|                | Class Instance conflict | 0119                    |
|                | Missing attribute       | 0120                    |
|                | Missing attribute value | 0121                    |
|                | Resource limitation     | 0213                    |
| Success        | MPPS Instance created   | 0000                    |

### 13.1.2.1.4 Associated Real-World Activity – MPPS UI-Update

With the MPPS UI the status of the MPPS Instance can be set to “COMPLETED” or “DISCONTINUED”. There is no cyclic update during performance of the procedure.

### 13.1.2.1.5 Proposed Presentation Contexts – MPPS UI-Update

This REAL-WORLD ACTIVITY will propose the same Presentation Contexts as with “Patient registered”. Please see table in section 13.1.2.1.2.

### 13.1.2.1.6 SOP Specific Conformance Statement – MPPS UI-Update

#### 13.1.2.1.6.1 Attributes used for the Performed Procedure Step N-SET

The Siemens AXIOM Aristos DICOM Modality Performed Procedure Step SCU informs the remote SCP about the performed examination and its status. The N-SET message is sent only per ended examination (finished status “COMPLETED” or incomplete status “DISCONTINUED”). The following table describes the supported attributes of a N-SET message.

| Attribute Name                                        | Tag         | Type | Value                                        |
|-------------------------------------------------------|-------------|------|----------------------------------------------|
| <b>Performed Procedure Step Information</b>           |             |      |                                              |
| Performed Procedure Step Status                       | (0040,0252) | 3    | "IN PROGRESS", "COMPLETED" or "DISCONTINUED" |
| Performed Procedure Step Description                  | (0040,0254) | 3    | from SPS Description or user input           |
| Procedure Code Sequence                               | (0008,1032) | 3    | from Requested Procedure Code                |
| >Code Value                                           | (0008,0100) | 1C   |                                              |
| >Coding Scheme Designator                             | (0008,0102) | 1C   |                                              |
| >Coding Scheme Version                                | (0008,0103) | 3    |                                              |
| >Code Meaning                                         | (0008,0104) | 3    |                                              |
| Performed Procedure Step End Date                     | (0040,0250) | 1    | created                                      |
| Performed Procedure Step End Time                     | (0040,0251) | 1    | created                                      |
| <b>Image Acquisition Results</b>                      |             |      |                                              |
| Performed Protocol Code Sequence                      | (0040,0260) | 3    | from Scheduled Protocol Code Sequence        |
| >Code Value                                           | (0008,0100) | 1C   |                                              |
| >Coding Scheme Designator                             | (0008,0102) | 1C   |                                              |
| >Coding Scheme Version                                | (0008,0103) | 3    |                                              |
| >Code Meaning                                         | (0008,0104) | 3    |                                              |
| Performed Series Sequence                             | (0040,0340) | 1    |                                              |
| >Performing Physician's Name                          | (0008,1050) | 2C   | from MWL or user input                       |
| >Protocol Name                                        | (0018,1030) | 1C   | from related SOP Instance                    |
| >Operator's Name                                      | (0008,1070) | 2C   | user input                                   |
| >Series Instance UID                                  | (0020,000E) | 1C   | from related SOP Instance                    |
| >Series Description                                   | (0008,103E) | 2C   | from related SOP Instance                    |
| >Retrieve AE Title                                    | (0008,0054) | 2C   |                                              |
| >Referenced Image Sequence                            | (0008,1140) | 2C   |                                              |
| >>Referenced SOP Class UID                            | (0008,1150) | 1C   |                                              |
| >>Referenced SOP Instance UID                         | (0008,1155) | 1C   |                                              |
| >Referenced Non-Image Composite SOP Instance Sequence | (0040,0220) | 2C   | <zero-length>                                |
| <b>Radiation Dose</b>                                 |             |      |                                              |
| Total Number of Exposures                             | (0040,0301) | 3    |                                              |
| Distance Source to Detector                           | (0018,1110) | 3    |                                              |
| Image Area Dose Product                               | (0018,115E) | 3    |                                              |
| <b>Billing and Material Management Code</b>           |             |      |                                              |
| Film Consumption Sequence                             | (0040,0321) | 3    |                                              |
| >Number of Films                                      | (2100,0170) | 3    | <zero-length>                                |
| >Medium Type                                          | (2000,0030) | 3    | <zero-length>                                |
| >Film Size ID                                         | (2010,0050) | 3    | <zero-length>                                |

## 13.1.2.1.6.2 Status Codes of the Performed Procedure Step N-SET

The Performed Procedure Step SCU interprets following status codes:

| Service Status | Meaning                                                                       | Error Codes<br>(0000.0900) |
|----------------|-------------------------------------------------------------------------------|----------------------------|
| Failure        | Processing Failure: Performed Procedure Step Object may no longer be updated. | 0110                       |
|                | No such attribute                                                             | 0105                       |
|                | Invalid attribute value                                                       | 0106                       |
|                | No such SOP Instance                                                          | 0112                       |
|                | Invalid Object instance                                                       | 0117                       |
|                | No such SOP Class                                                             | 0118                       |
|                | Class Instance conflict                                                       | 0119                       |
|                | Missing attribute value                                                       | 0121                       |
|                | Resource limitation                                                           | 0213                       |
| Success        | MPPS Instance set                                                             | 0000                       |

## **14 Communication Profiles**

### **14.1 Supported Communication Stacks**

The Siemens AXIOM Aristos DICOM application provides DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.  
The product target Operating System is Windows XP.

#### **14.1.1 TCP/IP Stack**

The AXIOM Aristos DICOM application uses the TCP/IP stack from the target operating system upon which it executes. It uses the MergeCOM subroutine library from Merge Technologies Inc. that is based on a Berkeley socket interface.

##### **14.1.1.1 API**

The AXIOM Aristos DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

##### **14.1.1.2 Physical Media Support**

The AXIOM Aristos DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the target operating system upon which it executes.

## **15 Extensions / Specializations / Privatizations**

### **15.1.1 Standard Extended / Specialized / Private SOPs**

Please refer to Annex for further information on these topics. A detailed overview is given there.

### **15.1.2 Private Transfer Syntaxes**

Not applicable

## 16 Configuration

### 16.1 AE Title/Presentation Address Mapping

To ensure unique identification within the network the hostname should be used as part of the AE Titles (see examples below, hostname = name1). The string can be up to 16 characters long and must not contain any extended characters, only 7-bit ASCII characters (excluding Control Characters) are allowed according to DICOM Standard.

**Note:** the current implementation of syngo does not support the full DICOM Standard. Spaces and special characters (like &<> ") in the AE title string are not supported.

#### 16.1.1 DICOM Verification

The Verification Service uses the AE configuration of the DICOM Service that is checked with the C-ECHO message. e.g. Verification will use the Storage AE, if initiated to check the configuration of a remote DICOM node.

#### 16.1.2 DICOM AE Titles

Within syngo there are local application entity titles for HIS/RIS, Study Transfer and Print. They can be configured via Service-UI in Configuration / DICOM / General (e.g. STU\_NAME1).

The own port number of the AXIOM Aristos is set to the fixed value of 104.

### 16.2 Configurable Parameters

The Application Entity Titles, host names and port numbers for remote AE are configured using the AXIOM Aristos Service/Installation Tool. For each AET the list of services supported can be configured.

#### 16.2.1 Storage and Storage Commitment

The AXIOM Aristos Service/Installation Tool can be used to set the AETs, port-numbers, host-names, IP-addresses and capabilities for the remote nodes (SCPs).

The AXIOM Aristos Service/Installation Tool can be used to configure whether the association will be kept open to receive the Storage Commitment response or to close the association and be prepared to receive the response on another association. A time-out can be configured that defines how long the association of N-ACTION is kept to receive a N-EVENT-REPORT on the same association. The same value is used to wait for a N-EVENT-REPORT on an other association. (default 1 h)

The user can select the compression mode for each SCP separately.

#### 16.2.2 Print

The AXIOM Aristos Service/Installation Tool can be used to configure the SCP (DICOM-Printer).

These parameters are mandatory to set:

- AET

- host-name
- IP-address
- Port-number

These parameters have defaults as per configuration file and can be changed:

- default camera (yes/no)
- pixel size
- additional or changed film sheet formats (e.g. inch 14x14, inch 14x17, ...)
- list with mapping pixel size to each film sheet format
- minimal density
- stored printed film jobs
- media type
- film destination

### 16.2.3 Modality Worklist

The Service application can be used to set the AETs, port numbers, host names, IP addresses, capabilities and time-outs for the remote nodes (SCPs) **Additional configurable parameters for Modality Worklist Query are:**

- Query Waiting time - the time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec.)
- Max Query Match Number - the maximum number of entries accepted in one worklist (default is 200, maximum is 999)
- Query Interval: the time between two C-FIND-RQ to the Hospital Information system (default is 60 min., maximum is 1440 min.)

Broad Worklist Query behavior (two values are defined):

- Set the AE Title search attribute to the own AE Title, and the Modality search attribute to zero-length.
- Set the Modality search attribute to the own modality and the AE Title search attribute to zero-length.

## 16.3 Default Parameters

This installation tool also uses some default parameters:

- max PDU size set to 262144 Bytes (256 KB)
- time-out for accepting/rejecting an association request: 60 s
- time-out for responding to an association open/close request: 60 s
- time-out for accepting a message over network: 60 s
- time-out for waiting for data between TCP/IP-packets: 60 s

The time-outs for waiting for a Service Request/Response message from the remote node are as follows:

- for Storage SCU: 600 s
- for Storage Commitment SCU, time-out for Response to N-ACTION: 600 s

- time-out for Response to Print Management N-SET-RQ: 240 s
- time-out for Response to other Print Management Requests: 60 s

## 17 Support of Extended Character Sets

The AXIOM Aristos DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

Also the Japanese language character sets JIS X 0201 (ISO-IR 13 Japanese katakana and ISO-IR 14 Japanese romaji), JIS X 0208 (ISO-IR 87 Japanese kanji) and JIS X 0212 (ISO-IR 159 Supplementary Japanese kanji) are supported.

## **A ANNEX**

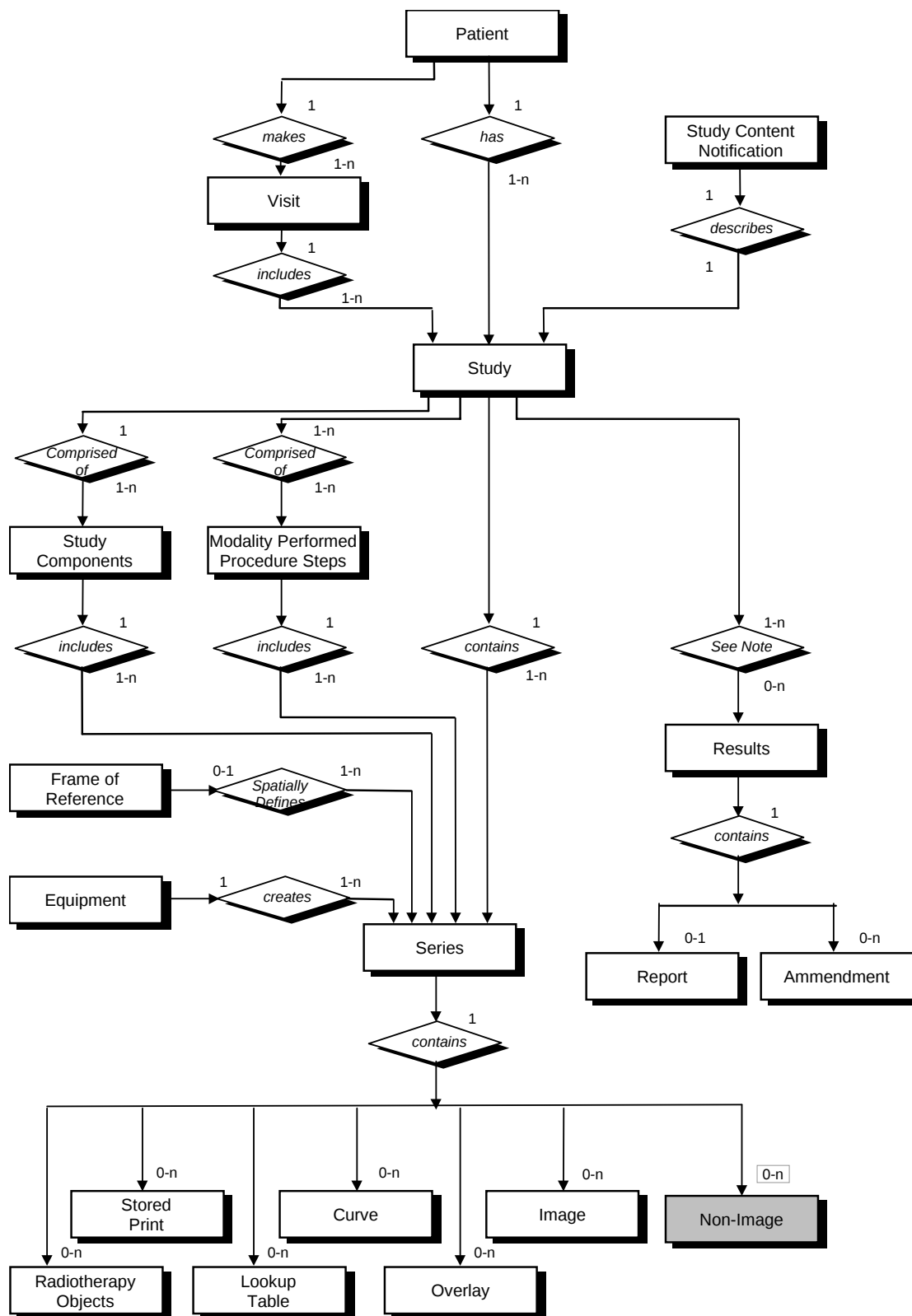
### **A.1 SIEMENS Private Non-Image IOD**

For encoding binary data-streams not representing image data, Siemens has created a private “Non-Image IOD” according to the rules governed by the DICOM Standard. The following section will roll-out the definition of this Private IOD. It can be communicated with Network Storage Service and Offline Media Storage Services.

The Siemens “Non-Image IOD” is identified by a private Non-Image Storage SOP Class UID of „1.3.12.2.1107.5.9.1“

#### **A.1.1 Siemens Non-Image IOD – E-R Model**

The E-R model in A.1.2 depicts those components of the DICOM Information Model that directly refer to the Siemens Non-Image IOD. The Frame of Reference IE, Overlay IE, Modality Lookup-Table IE, VOI Lookup-Table IE and Curve IE are not components of the Siemens Non-Image IOD.



**A.1.2 Siemens Non-Image IOD - Module Table**

| IE        | Module            | Reference         | Usage |
|-----------|-------------------|-------------------|-------|
| Patient   | Patient           | [1] PS3.3 C.7.1.1 | M     |
| Study     | General Study     | [1] PS3.3 C.7.2.1 | M     |
|           | Patient Study     | [1] PS3.3 C.7.2.2 | U     |
| Series    | General Series    | [1] PS3.3 C.7.3.1 | M     |
| Equipment | General Equipment | [1] PS3.3 C.7.5.1 | U     |
| CSA       | CSA Image Header  | A.2.1             | U     |
|           | CSA Series Header | A.2.2             | U     |
|           | MEDCOM Header     | A.2.3             | U     |
|           | CSA Non-Image     | A.1.3.1           | M     |
|           | SOP Common        | [1] PS3.3 C.12.1  | M     |

**A.1.3 Siemens Non-Image IOD - Modules****A.1.3.1 CSA Non-Image Module**

The table in this section contains private IOD Attributes that describe CSA Non-Images.

| Attribute Name            | Tag         | Owner | Type | Notes                                                                                                                                                                                                                                            |
|---------------------------|-------------|-------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Image Type                | (0008,0008) | -     | 3    | Image identification characteristics.                                                                                                                                                                                                            |
| Acquisition Date          | (0008,0022) | -     | 3    | The date the acquisition of data that resulted in this data set started.                                                                                                                                                                         |
| Acquisition Time          | (0008,0032) | -     | 3    | The time the acquisition of data that resulted in this data set started.                                                                                                                                                                         |
| Conversion Type           | (0008,0064) | -     | 3    | Describes the kind of image conversion.<br>Defined Terms: DV = Digitized Video, DI = Digital Interface, DF = Digitized Film, WSD = Workstation.                                                                                                  |
| Referenced Image Sequence | (0008,1140) | -     | 3    | A sequence which provides reference to a set of Image SOP Class/Instance identifying other images significantly related to this data set.<br>Encoded as sequence of items: (0008,1150) and (0008,1155).                                          |
| Derivation Description    | (0008,2111) | -     | 3    | A text description of how this data set was derived.                                                                                                                                                                                             |
| Source Image Sequence     | (0008,2112) | -     | 3    | A Sequence that identifies the set of Image SOP Class/Instance pairs of the Images that were used to derive this data set.<br>Zero or more Items may be included in this Sequence.<br>Encoded as sequence of items: (0008,1150) and (0008,1155). |
| Patient Position          | (0018,5100) | -     | 3    | Patient position descriptor relative to the equipment.                                                                                                                                                                                           |
| Acquisition Number        | (0020,0012) | -     | 3    | A number identifying the single continuous gathering of data over a period of time which resulted in this data set.                                                                                                                              |
| Image Number              | (0020,0013) | -     | 3    | A number that identifies this data set.                                                                                                                                                                                                          |
| Frame of Reference UID    | (0020,0052) | -     | 3    | Uniquely identifies the frame of reference for a Series.                                                                                                                                                                                         |
| Image Comments            | (0020,4000) | -     | 3    | User-defined comments about the image.                                                                                                                                                                                                           |
| Quality Control Image     | (0028,0300) | -     | 3    | Indicates whether or not this image is a quality control or phantom image.                                                                                                                                                                       |

| Attribute Name                | Tag         | Owner                 | Type | Notes                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------|-------------|-----------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |             |                       |      | If this Attribute is absent, then the image may or may not be a quality control or phantom image.<br>Enumerated Values: YES, NO.                                                                                                                                                                                                                                                                                            |
| Burned in Annotation          | (0028,0301) | -                     | 3    | Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. If this Attribute is absent, then the image may or may not contain burned in annotation.<br>Enumerated Values: YES, NO.                                                                                                                                                                    |
| Lossy Image Compression       | (0028,2110) | -                     | 3    | Specifies whether an Image has undergone lossy compression.<br>Enumerated Values: 00 = Image has NOT been subjected to lossy compression, 01 = Image has been subjected to lossy compression.                                                                                                                                                                                                                               |
| Lossy Image Compression Ratio | (0028,2112) | -                     | 3    | Describes the approximate lossy compression ratio(s) that have been applied to this image. May be multi valued if successive lossy compression steps have been applied.                                                                                                                                                                                                                                                     |
| CSA Data Type                 | (0029,xx08) | SIEMENS CSA NON-IMAGE | 1    | CSA Data identification characteristics.<br>Defined Terms:<br>BSR REPORT = Exam Protocol Data of Artis<br>RADIS REPORT = Exam Protocol Data of Aristos<br>3D EDITOR<br>3D FLY PATH = Fly Through Data<br>3D FLY VRT = Fly Through Data<br>3D FUSION MATRIX = Fusion Data<br>RAW DATA NUM 4 = NUMARIS/ Raw Data<br>RAW DATA SOM 5 = SOMARIS/ Raw Data<br>RT3D CONFIG = InSpaceIS Data<br>SPEC NUM 4 = NUMARIS/4 Spectroscopy |
| CSA Data Version              | (0029,xx09) | SIEMENS CSA NON-IMAGE | 3    | Version of CSA Data Info (0029,xx10) format and CSA Non-Image Data (7FE1,xx10) format.                                                                                                                                                                                                                                                                                                                                      |
| CSA Data Info                 | (0029,xx10) | SIEMENS CSA NON-IMAGE | 3    | Information to describe the CSA Data (7FE1,xx10).                                                                                                                                                                                                                                                                                                                                                                           |
| CSA Data                      | (7FE1,xx10) | SIEMENS CSA NON-IMAGE | 2    | Binary data as byte stream.                                                                                                                                                                                                                                                                                                                                                                                                 |

## A.2 Siemens Standard Extended Modules

| IE    | Module                               | Reference | Usage | Note                                    |
|-------|--------------------------------------|-----------|-------|-----------------------------------------|
| Image | CSA Image Header Module              | A.2.1     | U     | private GG information                  |
|       | CSA Series Header Module             | A.2.2     | U     |                                         |
|       | MEDCOM Header Module                 | A.2.3     | U     | private syngo information               |
|       | MEDCOM OOG Module                    | A.2.4     | U     | if object graphics is attached to image |
|       | Aristos FD Lab Settings              | A.2.5     | U     |                                         |
|       | Aristos FD Processing Settings       | A.2.6     | U     |                                         |
|       | Aristos FD Raw Image Settings Module | A.2.7     | U     |                                         |

### A.2.1 CSA Image Header Module

The table in this section contains private IOD Attributes that describe the CSA Image Header:

| Attribute Name           | Tag         | Owner              | Type | Notes                                                                                                        |
|--------------------------|-------------|--------------------|------|--------------------------------------------------------------------------------------------------------------|
| CSA Image Header Type    | (0029,xx08) | SIEMENS CSA HEADER | 1    | CSA Image Header identification characteristics.<br>Defined Terms:<br>NUM 4 = NUMARIS/4<br>SOM 5 = SOMARIS/5 |
| CSA Image Header Version | (0029,xx09) | SIEMENS CSA HEADER | 3    | Version of CSA Image Header Info (0029,xx10) format.                                                         |
| CSA Image Header Info    | (0029,xx10) | SIEMENS CSA HEADER | 3    | Manufacturer model dependent information.                                                                    |

### A.2.2 CSA Series Header Module

The table in this section contains private IOD Attributes that describe the CSA Series Header:

| Attribute Name            | Tag         | Owner              | Type | Notes                                                                                    |
|---------------------------|-------------|--------------------|------|------------------------------------------------------------------------------------------|
| CSA Series Header Type    | (0029,xx18) | SIEMENS CSA HEADER | 1    | CSA Series Header identification characteristics.<br>Defined Terms:<br>NUM 4 = NUMARIS/4 |
| CSA Series Header Version | (0029,xx19) | SIEMENS CSA HEADER | 3    | Version of CSA Series Header Info (0029,xx20) format.                                    |
| CSA Series Header Info    | (0029,xx20) | SIEMENS CSA HEADER | 3    | Manufacturer model dependent information.                                                |

### A.2.3 MEDCOM Header Module

The table in this section contains private IOD Attributes that describe MEDCOM Header:

| Attribute Name        | Tag         | Owner                 | Type | Notes                                                                                                                                |
|-----------------------|-------------|-----------------------|------|--------------------------------------------------------------------------------------------------------------------------------------|
| MedCom Header Type    | (0029,xx08) | SIEMENS MEDCOM HEADER | 1C   | MedCom Header identification characteristics.<br>Defined Terms:<br>MEDCOM 1<br>(Required if MedCom Header Info (0029,xx10) present.) |
| MedCom Header Version | (0029,xx09) | SIEMENS MEDCOM HEADER | 2C   | Version of MedCom Header Info (0029,xx10) format.<br>(Required if MEDCOM Header Info (0029,xx10) present.)                           |
| MedCom Header Info    | (0029,xx10) | SIEMENS MEDCOM HEADER | 3    | Manufacturer model dependent information.                                                                                            |

| Attribute Name                         | Tag         | Owner                  | Type | Notes                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------|-------------|------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        |             |                        |      | The value of the attribute MedCom Header Info (0029,xx10) can be build up in each user defined format.                                                                                                                                                                                                                                                                      |
| MedCom History Information             | (0029,xx20) | SIEMENS MEDCOM HEADER  | 3    | MedCom defined Patient Registration history information. See A.2.3.1.                                                                                                                                                                                                                                                                                                       |
| PMTF Information 1                     | (0029,xx31) | SIEMENS MEDCOM HEADER  | 3    | Transformation Information                                                                                                                                                                                                                                                                                                                                                  |
| PMTF Information 2                     | (0029,xx32) | SIEMENS MEDCOM HEADER  | 3    | Transformation Information                                                                                                                                                                                                                                                                                                                                                  |
| PMTF Information 3                     | (0029,xx33) | SIEMENS MEDCOM HEADER  | 3    | Transformation Information                                                                                                                                                                                                                                                                                                                                                  |
| PMTF Information 4                     | (0029,xx34) | SIEMENS MEDCOM HEADER  | 3    | Transformation Information                                                                                                                                                                                                                                                                                                                                                  |
| PMTF Information 5                     | (0029,xx35) | SIEMENS MEDCOM HEADER  | 3    | Transformation Information                                                                                                                                                                                                                                                                                                                                                  |
| Application Header Sequence            | (0029,xx40) | SIEMENS MEDCOM HEADER  | 3    | Sequence of Application Header items. Zero or more items are possible.                                                                                                                                                                                                                                                                                                      |
| >Application Header Type               | (0029,xx41) | SIEMENS MEDCOM HEADER  | 1C   | Application Header identification characteristics. Required, if Sequence is sent.                                                                                                                                                                                                                                                                                           |
| >Application Header ID                 | (0029,xx42) | SIEMENS MEDCOM HEADER  | 3    | Identification of an application header                                                                                                                                                                                                                                                                                                                                     |
| >Application Header Version            | (0029,xx43) | SIEMENS MEDCOM HEADER  | 3    | Version of CSA Series Header Info (0029,xx44) format.                                                                                                                                                                                                                                                                                                                       |
| >Application Header Info               | (0029,xx44) | SIEMENS MEDCOM HEADER  | 3    | Application dependent information.                                                                                                                                                                                                                                                                                                                                          |
| Workflow Control Flags                 | (0029,xx50) | SIEMENS MEDCOM HEADER  | 3    | Eight free definable flags.                                                                                                                                                                                                                                                                                                                                                 |
| Archive Management Flag Keep Online    | (0029,xx51) | SIEMENS MEDCOM HEADER  | 3    | Flag to control remote archive management system to keep the image always online (also when already archived).<br>Enumerated Values:<br>00 = remote control not required<br>01 = keep image online                                                                                                                                                                          |
| Archive Management Flag Do Not Archive | (0029,xx52) | SIEMENS MEDCOM HEADER  | 3    | Flag to control remote archive management system not to archive the related image.<br>Enumerated Values:<br>00 = remote control not required<br>01 = don't archive image                                                                                                                                                                                                    |
| Image Location Status                  | (0029,xx53) | SIEMENS MEDCOM HEADER  | 3    | Image location status to control retrieving.<br>Defined Terms:<br>ONLINE = retrieving has to be done as usual,<br>NEARLINE = move request to SCP and delay according to value of Estimated Retrieve Time (0029,xx54),<br>OFFLINE = invoking a retrieve operation initiates an operator request,<br>INVALID = invoking a retrieve operation would always result in an error. |
| Estimated Retrieve Time                | (0029,xx54) | SIEMENS MEDCOM HEADER  | 3    | Estimated retrieve time in seconds. A value less then zero (< 0) indicates location is OFFLINE or INVALID.                                                                                                                                                                                                                                                                  |
| Data Size of Retrieved Images          | (0029,xx55) | SIEMENS MEDCOM HEADER  | 3    | Data size of images in MB                                                                                                                                                                                                                                                                                                                                                   |
| Series Workflow Status                 | (0029,xx60) | SIEMENS MEDCOM HEADER2 | 3    |                                                                                                                                                                                                                                                                                                                                                                             |

### A.2.3.1 MEDCOM History Information

The value of the attribute MEDCOM History Information (0029,xx20) is defined in the following way:

| Part    | Name                | Type   | Bytes | Notes                |
|---------|---------------------|--------|-------|----------------------|
| header  | Identifier          | string | 32    | Always "CSA HISTORY" |
|         | Version             | string | 32    | e.g. "V1.10"         |
| n Items | Class Name          | string | 64    |                      |
|         | Modification String | string | 1024  |                      |

### A.2.4 MEDCOM OOG Module

The table in this section contains private IOD Attributes that describe MEDCOM Object Oriented Graphics (OOG). This module is used whenever object graphics is drawn on the image and need to be stored as graphic object properties. Given the condition that the module contents was not removed by other modalities, the graphic objects remain re-animatable if such an image was transferred and is then retrieved back

| Attribute Name     | Tag         | Owner              | Type | Notes                                                                                                                   |
|--------------------|-------------|--------------------|------|-------------------------------------------------------------------------------------------------------------------------|
| MedCom OOG Type    | (0029,xx08) | SIEMENS MEDCOM OOG | 1    | MEDCOM Object Oriented Graphics (OOG) identification characteristics.<br>Defined Terms:<br>MEDCOM OOG 1<br>MEDCOM OOG 2 |
| MedCom OOG Version | (0029,xx09) | SIEMENS MEDCOM OOG | 3    | Version of MEDCOM OOG Info (0029,xx10) format.                                                                          |
| MedCom OOG Info    | (0029,xx10) | SIEMENS MEDCOM OOG | 3    | MEDCOM Object Oriented Graphics (OOG) data.                                                                             |

The graphics objects are also fully drawn in the Image Overlay Plane for compatibility with other products, which do not support the MedCom OOG module. Any system not supporting the MedCom OOG module shall remove the OOG module and it's contents when modifying the image overlay plane content.

### A.2.5 Aristos FD Lab Settings

The table in this section contains private IOD Attributes that give information about system settings.

| Attribute Name          | Tag         | Owner                                  | Type | Notes                                                 |
|-------------------------|-------------|----------------------------------------|------|-------------------------------------------------------|
| Internal Value          | (0019,xx00) | Siemens: Thorax/Multix FD Lab Settings | 3    |                                                       |
| Total Area Dose Product | (0019,xx02) | Siemens: Thorax/Multix FD Lab Settings | 3    | in $\mu\text{Gy} \cdot \text{m}^2$<br>only for CR IOD |
| Cassette Image          | (0019,xx05) | Siemens: Thorax/Multix FD Lab Settings | 3    |                                                       |
| Table Object Distance   | (0019,xx06) | Siemens: Thorax/Multix FD Lab Settings | 3    | in mm                                                 |
| Table Detector Distance | (0019,xx07) | Siemens: Thorax/Multix FD Lab Settings | 3    | in mm                                                 |
| Ortho Step Distance     | (0019,xx08) | Siemens: Thorax/Multix FD Lab Settings | 3    | Distance to previous step of ortho series in 0.1 mm.  |

### A.2.6 Aristos FD Processing Settings

The table in this section contains private IOD Attributes that give information about processing settings.

| Attribute Name             | Tag         | Owner                                        | Type | Notes                                                  |
|----------------------------|-------------|----------------------------------------------|------|--------------------------------------------------------|
| Label Left                 | (0021,xx00) | Siemens: Thorax/Multix<br>FD Post Processing | 3    | Enumerated Values:<br>{0,1}                            |
| Label Left Orientation     | (0021,xx01) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Left Percentage X    | (0021,xx02) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Left Percentage Y    | (0021,xx03) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Right                | (0021,xx04) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    | Enumerated Values:<br>{0,1}                            |
| Label Right Orientation    | (0021,xx05) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Right Percentage X   | (0021,xx06) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Right Percentage Y   | (0021,xx07) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Auto Window Flag           | (0021,xx08) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Auto Window Center         | (0021,xx09) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Auto Window Width          | (0021,xx0A) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Filter ID                  | (0021,xx0B) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    | Defined Terms:<br>{ 0, 1, 2, 3, 4, 5, 6 }              |
| Degree of Edge Enhancement | (0021,xx0C) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Half Kernel Size           | (0021,xx0D) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Dose Control Value         | (0021,xx0E) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    | Exposure Index (EXI)<br>only for CR IOD                |
| Deleted Image Flag         | (0021,xx0F) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Same Size Support          | (0021,xx10) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Left Init Position   | (0021,xx11) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Label Right Init Position  | (0021,xx12) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Patient Rotation           | (0021,xx13) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Anatomic Correct View Flag | (0021,xx14) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    |                                                        |
| Auto Window Shift          | (0021,xx15) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    | Offset added to calculated auto<br>window center       |
| Auto Window Expansion      | (0021,xx16) | Siemens: Thorax/Multix<br>FD Lab Settings    | 3    | Factor multiplied with calculated<br>auto window width |

## A.2.7 Aristos FD Raw Image Settings Module

The table in this section contains private IOD Attributes that give information about the version.

| Attribute Name                    | Tag         | Owner                                           | Type | Notes                                   |
|-----------------------------------|-------------|-------------------------------------------------|------|-----------------------------------------|
| Raw Image Amplification           | (0025,xx00) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    |                                         |
| Gamma LUT                         | (0025,xx01) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    |                                         |
| Collimator Manual                 | (0025,xx02) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    |                                         |
| Collimator Up Left X Percentage   | (0025,xx03) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    | Percentage offset from 3K x 3K<br>image |
| Collimator Up Right X Percentage  | (0025,xx04) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    | Percentage offset from 3K x 3K<br>image |
| Collimator Low Left X Percentage  | (0025,xx05) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    | Percentage offset from 3K x 3K<br>image |
| Collimator Low Right X Percentage | (0025,xx06) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    | Percentage offset from 3K x 3K<br>image |
| Collimator Up Left Y Percentage   | (0025,xx07) | Siemens: Thorax/Multix<br>FD Raw Image Settings | 3    | Percentage offset from 3K x 3K<br>image |

| Attribute Name                    | Tag         | Owner                                        | Type | Notes                                |
|-----------------------------------|-------------|----------------------------------------------|------|--------------------------------------|
| Collimator Up Right Y Percentage  | (0025,xx08) | Siemens: Thorax/Multix FD Raw Image Settings | 3    | Percentage offset from 3K x 3K image |
| Collimator Low Left Y Percentage  | (0025,xx09) | Siemens: Thorax/Multix FD Raw Image Settings | 3    | Percentage offset from 3K x 3K image |
| Collimator Low Right Y Percentage | (0025,xx0A) | Siemens: Thorax/Multix FD Raw Image Settings | 3    | Percentage offset from 3K x 3K image |
| Set Gray                          | (0025,xx0B) | Siemens: Thorax/Multix FD Raw Image Settings | 3    | Enumerated Values: {0,1}             |
| Harmonization Kernel              | (0025,xx0C) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Harmonization Gain                | (0025,xx0D) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Edge Enhancement Kernel           | (0025,xx0E) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Edge Enhancement Gain             | (0025,xx0F) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Raw Image File Name               | (0025,xx10) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Global Offset                     | (0025,xx11) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Image Columns                     | (0025,xx12) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Image Rows                        | (0025,xx13) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Image Alignment                   | (0025,xx14) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Active Image Columns              | (0025,xx15) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Active Image Rows                 | (0025,xx16) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| System Type                       | (0025,xx17) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Auto Gain                         | (0025,xx18) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |
| Ortho Sub Sampling                | (0025,xx19) | Siemens: Thorax/Multix FD Raw Image Settings | 3    |                                      |

### A.3 Registry of DICOM Data Elements

| Tag         | Private Owner Code                           | Name                             | VR | VM |
|-------------|----------------------------------------------|----------------------------------|----|----|
| (0019,xx02) | Siemens: Thorax/Multix FD Lab Settings       | Total Area Dose Product          | LO | 1  |
| (0019,xx05) | Siemens: Thorax/Multix FD Lab Settings       | Cassette Image                   | US | 1  |
| (0019,xx06) | Siemens: Thorax/Multix FD Lab Settings       | Table Object Distance            | FD | 1  |
| (0019,xx07) | Siemens: Thorax/Multix FD Lab Settings       | Table Detector Distance          | FD | 1  |
| (0019,xx08) | Siemens: Thorax/Multix FD Lab Settings       | Ortho Step Distance              | US | 1  |
| (0021,xx00) | Siemens: Thorax/Multix FD Post Processing    | Label Left                       | US | 1  |
| (0021,xx01) | Siemens: Thorax/Multix FD Lab Settings       | Label Left Orientation           | SS | 1  |
| (0021,xx02) | Siemens: Thorax/Multix FD Lab Settings       | Label Left Percentage X          | FL | 1  |
| (0021,xx03) | Siemens: Thorax/Multix FD Lab Settings       | Label Left Percentage X          | FL | 1  |
| (0021,xx04) | Siemens: Thorax/Multix FD Lab Settings       | Label Right                      | US | 1  |
| (0021,xx05) | Siemens: Thorax/Multix FD Lab Settings       | Label Right Orientation          | SS | 1  |
| (0021,xx06) | Siemens: Thorax/Multix FD Lab Settings       | Label Right Percentage X         | FL | 1  |
| (0021,xx07) | Siemens: Thorax/Multix FD Lab Settings       | Label Right Percentage X         | FL | 1  |
| (0021,xx08) | Siemens: Thorax/Multix FD Lab Settings       | Auto Window Flag                 | US | 1  |
| (0021,xx09) | Siemens: Thorax/Multix FD Lab Settings       | Auto Window Center               | SL | 1  |
| (0021,xx0A) | Siemens: Thorax/Multix FD Lab Settings       | Auto Window Width                | SL | 1  |
| (0021,xx0B) | Siemens: Thorax/Multix FD Lab Settings       | Filter ID                        | SS | 1  |
| (0021,xx0C) | Siemens: Thorax/Multix FD Lab Settings       | Degree of Edge Enhancement       | FL | 1  |
| (0021,xx0D) | Siemens: Thorax/Multix FD Lab Settings       | Half Kernel Size                 | SS | 1  |
| (0021,xx0E) | Siemens: Thorax/Multix FD Lab Settings       | Dose Control Value               | US | 1  |
| (0021,xx0F) | Siemens: Thorax/Multix FD Lab Settings       | Deleted Image Flag               | US | 1  |
| (0021,xx10) | Siemens: Thorax/Multix FD Lab Settings       | Same Size Support                | US | 1  |
| (0021,xx11) | Siemens: Thorax/Multix FD Lab Settings       | Label Left Init Position         | SS | 1  |
| (0021,xx12) | Siemens: Thorax/Multix FD Lab Settings       | Label Right Init Position        | SS | 1  |
| (0021,xx13) | Siemens: Thorax/Multix FD Lab Settings       | Patient Rotation                 | SS | 1  |
| (0021,xx14) | Siemens: Thorax/Multix FD Lab Settings       | Anatomic Correct View Flag       | US | 1  |
| (0021,xx15) | Siemens: Thorax/Multix FD Lab Settings       | Auto Window Shift                | SS | 1  |
| (0021,xx16) | Siemens: Thorax/Multix FD Lab Settings       | Auto Window Expansion            | DS | 1  |
| (0025,xx00) | Siemens: Thorax/Multix FD Raw Image Settings | Raw Image Amplification          | SS | 1  |
| (0025,xx01) | Siemens: Thorax/Multix FD Raw Image Settings | Gamma LUT                        | SS | 1  |
| (0025,xx02) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Manual                | US | 1  |
| (0025,xx03) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Up Left X Percentage  | FL | 1  |
| (0025,xx04) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Up Right X Percentage | FL | 1  |
| (0025,xx05) | Siemens: Thorax/Multix FD Raw                | Collimator Low Left X Percentage | FL | 1  |

| Tag         | Private Owner Code                           | Name                              | VR | VM |
|-------------|----------------------------------------------|-----------------------------------|----|----|
|             | Image Settings                               |                                   |    |    |
| (0025,xx06) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Low Right X Percentage | FL | 1  |
| (0025,xx07) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Up Left Y Percentage   | FL | 1  |
| (0025,xx08) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Up Right Y Percentage  | FL | 1  |
| (0025,xx09) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Low Left Y Percentage  | FL | 1  |
| (0025,xx0A) | Siemens: Thorax/Multix FD Raw Image Settings | Collimator Low Right Y Percentage | FL | 1  |
| (0025,xx0B) | Siemens: Thorax/Multix FD Raw Image Settings | Set Gray                          | US | 1  |
| (0025,xx0C) | Siemens: Thorax/Multix FD Raw Image Settings | Harmonization Kernel              | SS | 1  |
| (0025,xx0D) | Siemens: Thorax/Multix FD Raw Image Settings | Harmonization Gain                | FL | 1  |
| (0025,xx0E) | Siemens: Thorax/Multix FD Raw Image Settings | Edge Enhancement Kernel           | SS | 1  |
| (0025,xx0F) | Siemens: Thorax/Multix FD Raw Image Settings | Edge Enhancement Gain             | FL | 1  |
| (0025,xx10) | Siemens: Thorax/Multix FD Raw Image Settings | Raw Image File Name               | LT | 1  |
| (0025,xx11) | Siemens: Thorax/Multix FD Raw Image Settings | Global Offset                     | SS | 1  |
| (0025,xx12) | Siemens: Thorax/Multix FD Raw Image Settings | Image Columns                     | SS | 1  |
| (0025,xx13) | Siemens: Thorax/Multix FD Raw Image Settings | Image Rows                        | SS | 1  |
| (0025,xx14) | Siemens: Thorax/Multix FD Raw Image Settings | Image Alignment                   | SS | 1  |
| (0025,xx15) | Siemens: Thorax/Multix FD Raw Image Settings | Active Image Columns              | SS | 1  |
| (0025,xx16) | Siemens: Thorax/Multix FD Raw Image Settings | Active Image Rows                 | SS | 1  |
| (0025,xx17) | Siemens: Thorax/Multix FD Raw Image Settings | System Type                       | LO | 1  |
| (0025,xx18) | Siemens: Thorax/Multix FD Raw Image Settings | Auto Gain                         | US | 1  |
| (0025,xx19) | Siemens: Thorax/Multix FD Raw Image Settings | Ortho Sub Sampling                | US | 1  |
| (0029,xx08) | SIEMENS CSA NON-IMAGE                        | CSA Data Type                     | CS | 1  |
| (0029,xx09) | SIEMENS CSA NON-IMAGE                        | CSA Data Version                  | LO | 1  |
| (0029,xx10) | SIEMENS CSA NON-IMAGE                        | CSA Data Info                     | OB | 1  |
| (0029,xx08) | SIEMENS CSA HEADER                           | CSA Image Header Type             | CS | 1  |
| (0029,xx09) | SIEMENS CSA HEADER                           | CSA Image Header Version          | LO | 1  |
| (0029,xx10) | SIEMENS CSA HEADER                           | CSA Image Header Info             | OB | 1  |
| (0029,xx18) | SIEMENS CSA HEADER                           | CSA Series Header Type            | CS | 1  |
| (0029,xx19) | SIEMENS CSA HEADER                           | CSA Series Header Version         | LO | 1  |
| (0029,xx20) | SIEMENS CSA HEADER                           | CSA Series Header Info            | OB | 1  |
| (0029,xx08) | SIEMENS MEDCOM HEADER                        | MedCom Header Type                | CS | 1  |
| (0029,xx09) | SIEMENS MEDCOM HEADER                        | MedCom Header Version             | LO | 1  |
| (0029,xx10) | SIEMENS MEDCOM HEADER                        | MedCom Header Info                | OB | 1  |
| (0029,xx20) | SIEMENS MEDCOM HEADER                        | MedCom History Information        | OB | 1  |
| (0029,xx31) | SIEMENS MEDCOM HEADER                        | PMTF Information 1                | LO | 1  |
| (0029,xx32) | SIEMENS MEDCOM HEADER                        | PMTF Information 2                | UL | 1  |
| (0029,xx33) | SIEMENS MEDCOM HEADER                        | PMTF Information 3                | UL | 1  |
| (0029,xx34) | SIEMENS MEDCOM HEADER                        | PMTF Information 4                | CS | 1  |
| (0029,xx35) | SIEMENS MEDCOM HEADER                        | PMTF Information 5                | UL | 1  |
| (0029,xx40) | SIEMENS MEDCOM HEADER                        | Application Header Sequence       | SQ | 1  |
| (0029,xx41) | SIEMENS MEDCOM HEADER                        | Application Header Type           | CS | 1  |
| (0029,xx42) | SIEMENS MEDCOM HEADER                        | Application Header ID             | LO | 1  |
| (0029,xx43) | SIEMENS MEDCOM HEADER                        | Application Header Version        | LO | 1  |

| Tag         | Private Owner Code     | Name                              | VR | VM |
|-------------|------------------------|-----------------------------------|----|----|
| (0029,xx44) | SIEMENS MEDCOM HEADER  | Application Header Info           | OB | 1  |
| (0029,xx50) | SIEMENS MEDCOM HEADER  | Workflow Control Flags            | LO | 8  |
| (0029,xx51) | SIEMENS MEDCOM HEADER  | Arch. Management Flag Keep Online | CS | 1  |
| (0029,xx52) | SIEMENS MEDCOM HEADER  | Arch. Mgmt Flag Do Not Archive    | CS | 1  |
| (0029,xx53) | SIEMENS MEDCOM HEADER  | Image Location Status             | CS | 1  |
| (0029,xx54) | SIEMENS MEDCOM HEADER  | Estimated Retrieve Time           | DS | 1  |
| (0029,xx55) | SIEMENS MEDCOM HEADER  | Data Size of Retrieved Images     | DS | 1  |
| (0029,xx60) | SIEMENS MEDCOM HEADER2 | Series Workflow Status            | LO | 1  |
| (0029,xx08) | SIEMENS MEDCOM OOG     | MedCom OOG Type                   | CS | 1  |
| (0029,xx09) | SIEMENS MEDCOM OOG     | MedCom OOG Version                | LO | 1  |
| (0029,xx10) | SIEMENS MEDCOM OOG     | MedCom OOG Info                   | OB | 1  |
| (7FE1,xx10) | SIEMENS CSA NON-IMAGE  | CSA Data                          | OB | 1  |

## A.4 Standard Extensions of all SOP Classes

The following tables list the data dictionary of all DICOM IOD attributes where the DICOM standard definitions are extended:

| Attribute Name   | Tag         | Private Creator | Type | Notes                                                                                                  |
|------------------|-------------|-----------------|------|--------------------------------------------------------------------------------------------------------|
| Image Type       | (0008,0008) | -               | 1    | see A.4.1<br>additional Defined Terms:<br>Defined Terms for value 4:<br>EXAM PROTOCOL<br>ORTHO<br>TOMO |
| Patient Position | (0018,5100) | -               | 2C   | see A.4.2<br>HLS<br>HLP<br>FLS<br>FLP<br>HLDL<br>HLDR<br>FLDL<br>FLDR                                  |

All SOP classes may contain additional type 3 attributes that DICOM standard defines in a different DICOM IOD or DICOM SOP class (attributes from Normalized SOP classes). The "Computed Radiography Image Storage SOP Class" contains attributes that the DICOM standard defines in the "Digital X-Ray Image Storage - For Presentation SOP Class"

Examples:

- Date / Time of Last Detector Calibration (0018,700C) / (0018,700E)
- Detector Temperature (0018,7001)
- Image Area Dose Product (0018,115E)

### A.4.1 Image Type

The Image Type (0008,0008) attribute identifies important image identification characteristics.

Value 1 shall identify the Pixel Data Characteristics; Enumerated Values for the Pixel Data Characteristics are:

- ORIGINAL = identifies an Original Image
- DERIVED = identifies a Derived Image (e.g. flipped, rotated etc.)

Value 2 shall identify the Patient Examination Characteristics; Enumerated Values for the Patient Examination Characteristics are:

- PRIMARY = identifies a Primary Image
- SECONDARY = identifies a Secondary Image (e.g. flipped, rotated etc.)

Value 3 shall identify any Image IOD specific specialization: not used

Value 4 that is implementation specific, the following terms are defined in addition to the DICOM standard definitions:

- ORTHO = identifies images acquired during an ortho stepping acquisition
- TOMO = identifies images acquired during an tomography acquisition
- CSA RESAMPLED = identifies images that were flipped or rotated

Value 5 that is implementation specific, the following term is used in addition to the DICOM standard definitions:

- EXAM PROTOCOL = identifies the Aristos Non-Image object

#### A.4.2 Patient Position

The Patient Position attribute (0018,5100) defines the patient position relative to the equipment.

The Defined Terms for this value were extended for the AXIOM Aristos. Here there are additional possibilities to position the patient towards the imaging equipment (i.e. detector).

the new values are:

- HLS (Head left - Supine)
- HLP (Head left - Prone)
- FLS (Feet left - Supine)
- FLP (Feet left - Prone)
- HLDL (Head left - Decubitus left)
- HLDR (Head left - Decubitus right)
- FLDL (Feet left - Decubitus left)
- FLDR (Feet left - Decubitus right)

#### A.4.3 Pixel Spacing

For support of legacy systems it is supported to copy the value of "Imager Pixel Spacing" (0018,1164) into the tag "Pixel Spacing" (0028,0030) (Configurable in the service tool).

It should be considered that "Pixel Spacing" is only defined for image IODs using the Image Plane Module. When this tag is used within the AXIOM Aristos the user has to consider a magnification factor due to the X-Ray projection.

## A.5 Computed Radiography Image Storage Standard Extended SOP Class

The AXIOM Aristos Workstation will create images encoded as CR Standard extended SOP Class. Please see the following table for complete overview of supplied Type 1/2/3 Standard and Private attributes:

*“overview of supplied attributes – CR image”*

| Attribute Name                     | Tag         | Value                                     |
|------------------------------------|-------------|-------------------------------------------|
| Specific Character Set             | (0008,0005) | (conf. Character Set is added, if needed) |
| Image Type                         | (0008,0008) | see A.4.1                                 |
| SOP Class UID                      | (0008,0016) | 1.2.840.10008.5.1.4.1.1.1                 |
| SOP Instance UID                   | (0008,0018) |                                           |
| Study Date                         | (0008,0020) |                                           |
| Series Date                        | (0008,0021) |                                           |
| Acquisition Date                   | (0008,0022) |                                           |
| Content Date                       | (0008,0023) |                                           |
| Study Time                         | (0008,0030) |                                           |
| Series Time                        | (0008,0031) |                                           |
| Acquisition Time                   | (0008,0032) |                                           |
| Content Time                       | (0008,0033) |                                           |
| Accession Number                   | (0008,0050) | from MWL or user input                    |
| Modality                           | (0008,0060) | "CR"                                      |
| Manufacturer                       | (0008,0070) | "SIEMENS"                                 |
| Institution Name                   | (0008,0080) | from MWL, configuration or user input     |
| Institution Address                | (0008,0081) | from MWL                                  |
| Referring Physician's Name         | (0008,0090) | from MWL or user input                    |
| Station Name                       | (0008,1010) | from system configuration                 |
| Study Description                  | (0008,1030) |                                           |
| Procedure Code Sequence            | (0008,1032) | from MWL                                  |
| >Code Value                        | (0008,0100) |                                           |
| >Coding Scheme Designator          | (0008,0102) |                                           |
| >Coding Scheme Version             | (0008,0103) |                                           |
| >Code Meaning                      | (0008,0104) |                                           |
| Series Description                 | (0008,103E) | organ program name                        |
| Physician(s) of Record             | (0008,1048) | from MWL                                  |
| Performing Physician's Name        | (0008,1050) | from MWL or user input                    |
| Operator's Name                    | (0008,1070) | from user input                           |
| Admitting Diagnoses Description    | (0008,1080) | from MWL or user input                    |
| Manufacturer's Model Name          | (0008,1090) | "SIEMENS FD-X"                            |
| Referenced Study Sequence          | (0008,1110) | from MWL                                  |
| >Referenced SOP Class UID          | (0008,1150) |                                           |
| >Referenced SOP Instance UID       | (0008,1155) |                                           |
| Referenced Procedure Step Sequence | (0008,1111) | reference to MPPS                         |
| >Referenced SOP Class UID          | (0008,1150) |                                           |
| >Referenced SOP Instance UID       | (0008,1155) |                                           |
| Referenced Patient Sequence        | (0008,1120) | from MWL                                  |
| >Referenced SOP Class UID          | (0008,1150) |                                           |
| >Referenced SOP Instance UID       | (0008,1155) |                                           |
| Derivation Description             | (0008,2111) | info about flip and rotate                |
| Patient's Name                     | (0010,0010) | from MWL or user input                    |
| Patient ID                         | (0010,0020) | from MWL or user input                    |
| Patient's Birth Date               | (0010,0030) | from MWL or user input                    |
| Patient's Sex                      | (0010,0040) | from MWL or user input                    |

| Attribute Name                            | Tag         | Value                                                                                                                |
|-------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------|
| Other Patient IDs                         | (0010,1000) | from MWL                                                                                                             |
| Other Patient Names                       | (0010,1001) | from MWL                                                                                                             |
| Patient's Age                             | (0010,1010) | calculated from (0010,0030) or user input                                                                            |
| Patient's Size                            | (0010,1020) | from MWL or user input                                                                                               |
| Patient's Weight                          | (0010,1030) | from MWL or user input                                                                                               |
| Patient's Address                         | (0010,1040) | from MWL or user input                                                                                               |
| Military Rank                             | (0010,1080) | from MWL or user input                                                                                               |
| Medical Alerts                            | (0010,2000) | from MWL                                                                                                             |
| Contrast Allergies                        | (0010,2110) | from MWL                                                                                                             |
| Ethnic Group                              | (0010,2160) | from MWL or user input                                                                                               |
| Smoking Status                            | (0010,21A0) | from MWL                                                                                                             |
| Additional Patient History                | (0010,21B0) | from MWL                                                                                                             |
| Pregnancy Status                          | (0010,21C0) | from MWL                                                                                                             |
| Last Menstrual Date                       | (0010,21D0) | from MWL                                                                                                             |
| Patient Comments                          | (0010,4000) | from MWL or user input                                                                                               |
| Body Part Examined                        | (0018,0015) | zero-length                                                                                                          |
| KVP                                       | (0018,0060) |                                                                                                                      |
| Device Serial Number                      | (0018,1000) | from configuration                                                                                                   |
| Plate ID                                  | (0018,1004) | Detector Data:<br>- Factory Serial Number<br>- Factory Date Code<br>- Configuration Version<br>- Factory Part Number |
| Software Version (s)                      | (0018,1020) |                                                                                                                      |
| Protocol Name                             | (0018,1030) | same as "Series Description"                                                                                         |
| Distance Source to Detector               | (0018,1110) |                                                                                                                      |
| Distance Source to Patient                | (0018,1111) | only if anatomic measurement is activated                                                                            |
| Exposure Time                             | (0018,1150) |                                                                                                                      |
| X-Ray Tube Current                        | (0018,1151) |                                                                                                                      |
| Exposure                                  | (0018,1152) |                                                                                                                      |
| Exposure in $\mu$ As                      | (0018,1153) |                                                                                                                      |
| Image Area Dose Product                   | (0018,115E) |                                                                                                                      |
| Filter Type                               | (0018,1160) | "NONE" or "CU_0.1_MM" or "CU_0.2_MM" or "CU_0.3_MM"                                                                  |
| Imager Pixel Spacing                      | (0018,1164) | "0.143", "0.143 "                                                                                                    |
| Grid                                      | (0018,1166) | "NONE" or "FOCUSED"                                                                                                  |
| Collimator/grid Name                      | (0018,1180) |                                                                                                                      |
| Date of Last Calibration                  | (0018,1200) |                                                                                                                      |
| Acquisition Device Processing Description | (0018,1400) | Diamond View Description                                                                                             |
| Acquisition Device Processing Code        | (0018,1401) | Diamond View Code                                                                                                    |
| Relative X-Ray Exposure                   | (0018,1405) | EXI value                                                                                                            |
| Tomo Layer Height                         | (0018,1460) | only for Tomography                                                                                                  |
| Tomo Angle                                | (0018,1470) | only for Tomography                                                                                                  |
| Tomo Time                                 | (0018,1480) | only for Tomography                                                                                                  |
| Patient Position                          | (0018,5100) | see A.4.2                                                                                                            |
| View Position                             | (0018,5101) |                                                                                                                      |
| Sensitivity                               | (0018,6000) |                                                                                                                      |
| Detector Conditions Nominal Flag          | (0018,7000) |                                                                                                                      |
| Detector Temperature                      | (0018,7001) |                                                                                                                      |
| Date of Last Detector Calibration         | (0018,700C) | same as "Date of Last Calibration"                                                                                   |
| Time of Last Detector Calibration         | (0018,700E) |                                                                                                                      |
| Grid Focal Distance                       | (0018,704C) | "1150" or "1500" or "1800" or "3000"                                                                                 |
| Private Data                              | (0019,xxxx) | see A.2.5                                                                                                            |
| Study Instance UID                        | (0020,000D) | from MWL or created by system                                                                                        |
| Series Instance UID                       | (0020,000E) | created by system                                                                                                    |

| Attribute Name                        | Tag         | Value                                                                                       |
|---------------------------------------|-------------|---------------------------------------------------------------------------------------------|
| Study ID                              | (0020,0010) | from MWL or created by system                                                               |
| Series Number                         | (0020,0011) | unique within patient (1, 2, ...)                                                           |
| Acquisition Number                    | (0020,0012) | same as "Series Number"                                                                     |
| Instance Number                       | (0020,0013) | unique within series                                                                        |
| Patient Orientation                   | (0020,0020) |                                                                                             |
| Laterality                            | (0020,0060) |                                                                                             |
| Image Comments                        | (0020,4000) | from user input                                                                             |
| Private Data                          | (0021,xxxx) | see A.2.6                                                                                   |
| Private Data                          | (0025,xxxx) | see A.2.7                                                                                   |
| Samples per Pixel                     | (0028,0002) | 1                                                                                           |
| Photometric Interpretation            | (0028,0004) | "MONOCHROME2"                                                                               |
| Rows                                  | (0028,0010) | image size depends on collimation, max. 3072                                                |
| Columns                               | (0028,0011) | image size depends on collimation, max. 3072                                                |
| Pixel Spacing                         | (0028,0030) | only if configured in service UI<br>same as "Imager Pixel Spacing" (0018,1164)<br>see A.4.3 |
| Bits Allocated                        | (0028,0100) | 16                                                                                          |
| Bits Stored                           | (0028,0101) | 12                                                                                          |
| High Bit                              | (0028,0102) | 11                                                                                          |
| Pixel Representation                  | (0028,0103) | 0                                                                                           |
| Burned in Annotation                  | (0028,0301) | "NO"                                                                                        |
| Window Center                         | (0028,1050) |                                                                                             |
| Window Width                          | (0028,1051) |                                                                                             |
| Lossy Image Compression               | (0028,2110) |                                                                                             |
| Private Data                          | (0029,xxxx) | see A.2.1 to A.2.4                                                                          |
| Requesting Physician                  | (0032,1032) | from MWL                                                                                    |
| Requesting Service                    | (0032,1033) | from MWL                                                                                    |
| Request Description                   | (0032,1060) | from MWL                                                                                    |
| Requested Procedure Code Sequence     | (0032,1064) | from MWL                                                                                    |
| >Code Value                           | (0008,0100) |                                                                                             |
| >Coding Scheme Designator             | (0008,0102) |                                                                                             |
| >Coding Scheme Version                | (0008,0103) |                                                                                             |
| >Code Meaning                         | (0008,0104) |                                                                                             |
| Study Comments                        | (0032,4000) | from user input                                                                             |
| Special Needs                         | (0038,0050) | from MWL                                                                                    |
| Patient State                         | (0038,0500) | from MWL                                                                                    |
| Performed Procedure Step Start Date   | (0040,0244) | same as "Study Date" (0008,0020)                                                            |
| Performed Procedure Step Start Time   | (0040,0245) | same as "Study Time" (0008,0030)                                                            |
| Performed Procedure Step ID           | (0040,0253) | from MWL or created by system                                                               |
| Performed Procedure Step Description  | (0040,0254) |                                                                                             |
| Performed Protocol Code Sequence      | (0040,0260) | from MWL or MPPS UI                                                                         |
| >Code Value                           | (0008,0100) |                                                                                             |
| >Coding Scheme Designator             | (0008,0102) |                                                                                             |
| >Coding Scheme Version                | (0008,0103) |                                                                                             |
| >Code Meaning                         | (0008,0104) |                                                                                             |
| Request Attributes Sequence           | (0040,0275) | from MWL                                                                                    |
| >Scheduled Procedure Step Description | (0040,0007) |                                                                                             |
| >Scheduled Protocol Code Sequence     | (0040,0008) |                                                                                             |
| >>Code Value                          | (0008,0100) |                                                                                             |
| >>Coding Scheme Designator            | (0008,0102) |                                                                                             |
| >>Coding Scheme Version               | (0008,0103) |                                                                                             |
| >>Code Meaning                        | (0008,0104) |                                                                                             |
| >Scheduled Procedure Step ID          | (0040,0009) |                                                                                             |
| >Requested Procedure ID               | (0040,1001) |                                                                                             |

| Attribute Name                                         | Tag         | Value                                       |
|--------------------------------------------------------|-------------|---------------------------------------------|
| Confidentiality Constraint on Patient Data Description | (0040,3001) | from MWL                                    |
| Presentation LUT Shape                                 | (2050,0020) | "IDENTITY"                                  |
| Overlay Rows                                           | (60xx,0010) | same as "Rows" (0028,0010)                  |
| Overlay Columns                                        | (60xx,0011) | same as "Columns" (0028,0011)               |
| Number of Frames in Overlay                            | (60xx,0015) | 1 (if Overlay encoded in [60xx,3000])       |
| Overlay Description                                    | (60xx,0022) | "Siemens MedCom Object Graphics"            |
| Overlay Type                                           | (60xx,0040) | "G"                                         |
| Overlay Origin                                         | (60xx,0050) | 1\1                                         |
| Image Frame Origin                                     | (60xx,0051) | 1 (if Overlay encoded in [60xx,3000])       |
| Overlay Bits Allocated                                 | (60xx,0100) | 16 or 1 (if Overlay encoded in [60xx,3000]) |
| Overlay Bit Position                                   | (60xx,0102) | 12 or 0 (if Overlay encoded in [60xx,3000]) |
| Overlay Data                                           | [60xx,3000] | Graphics Overlay                            |
| Pixel Data                                             | (7FE0,0010) |                                             |

## A.6 Digital X-Ray Image Storage - For Presentation Standard Extended SOP Class

The AXIOM Aristos Workstation will create images encoded as DX - For Presentation Standard extended SOP Class. Please see the following table for complete overview of supplied Type 1/2/3 Standard and Private attributes:

*“overview of supplied attributes – DX image”*

| Attribute Name                     | Tag         | Value                                     |
|------------------------------------|-------------|-------------------------------------------|
| Specific Character Set             | (0008,0005) | (conf. Character Set is added, if needed) |
| Image Type                         | (0008,0008) | see A.4.1                                 |
| SOP Class UID                      | (0008,0016) | 1.2.840.10008.5.1.4.1.1.1.1               |
| SOP Instance UID                   | (0008,0018) |                                           |
| Study Date                         | (0008,0020) |                                           |
| Series Date                        | (0008,0021) |                                           |
| Acquisition Date                   | (0008,0022) |                                           |
| Content Date                       | (0008,0023) |                                           |
| Study Time                         | (0008,0030) |                                           |
| Series Time                        | (0008,0031) |                                           |
| Acquisition Time                   | (0008,0032) |                                           |
| Content Time                       | (0008,0033) |                                           |
| Accession Number                   | (0008,0050) | from MWL or user input                    |
| Modality                           | (0008,0060) | "DX"                                      |
| Presentation Intent Type           | (0008,0068) | "FOR PRESENTATION"                        |
| Manufacturer                       | (0008,0070) | "SIEMENS"                                 |
| Institution Name                   | (0008,0080) | from MWL, configuration or user input     |
| Institution Address                | (0008,0081) | from MWL                                  |
| Referring Physician's Name         | (0008,0090) | from MWL or user input                    |
| Station Name                       | (0008,1010) | from system configuration                 |
| Study Description                  | (0008,1030) |                                           |
| Procedure Code Sequence            | (0008,1032) | from MWL                                  |
| >Code Value                        | (0008,0100) |                                           |
| >Coding Scheme Designator          | (0008,0102) |                                           |
| >Coding Scheme Version             | (0008,0103) |                                           |
| >Code Meaning                      | (0008,0104) |                                           |
| Series Description                 | (0008,103E) | organ program name                        |
| Physician(s) of Record             | (0008,1048) | from MWL                                  |
| Performing Physician's Name        | (0008,1050) | from MWL or user input                    |
| Operator's Name                    | (0008,1070) | from user input                           |
| Admitting Diagnoses Description    | (0008,1080) | from MWL or user input                    |
| Manufacturer's Model Name          | (0008,1090) | "SIEMENS FD-X"                            |
| Referenced Study Sequence          | (0008,1110) | from MWL                                  |
| >Referenced SOP Class UID          | (0008,1150) |                                           |
| >Referenced SOP Instance UID       | (0008,1155) |                                           |
| Referenced Procedure Step Sequence | (0008,1111) | reference to MPPS                         |
| >Referenced SOP Class UID          | (0008,1150) |                                           |
| >Referenced SOP Instance UID       | (0008,1155) |                                           |
| Referenced Patient Sequence        | (0008,1120) | from MWL                                  |
| >Referenced SOP Class UID          | (0008,1150) |                                           |
| >Referenced SOP Instance UID       | (0008,1155) |                                           |
| Derivation Description             | (0008,2111) | info about flip and rotate                |
| Anatomic Region Sequence           | (0008,2218) | zero-length                               |
| Patient's Name                     | (0010,0010) | from MWL or user input                    |
| Patient ID                         | (0010,0020) | from MWL or user input                    |

| Attribute Name                              | Tag         | Value                                                                                                                |
|---------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------|
| Patient's Birth Date                        | (0010,0030) | from MWL or user input                                                                                               |
| Patient's Sex                               | (0010,0040) | from MWL or user input                                                                                               |
| Other Patient IDs                           | (0010,1000) | from MWL                                                                                                             |
| Other Patient Names                         | (0010,1001) | from MWL                                                                                                             |
| Patient's Age                               | (0010,1010) | calculated from (0010,0030) or user input                                                                            |
| Patient's Size                              | (0010,1020) | from MWL or user input                                                                                               |
| Patient's Weight                            | (0010,1030) | from MWL or user input                                                                                               |
| Patient's Address                           | (0010,1040) | from MWL or user input                                                                                               |
| Military Rank                               | (0010,1080) | from MWL or user input                                                                                               |
| Medical Alerts                              | (0010,2000) | from MWL                                                                                                             |
| Contrast Allergies                          | (0010,2110) | from MWL                                                                                                             |
| Ethnic Group                                | (0010,2160) | from MWL or user input                                                                                               |
| Smoking Status                              | (0010,21A0) | from MWL                                                                                                             |
| Additional Patient History                  | (0010,21B0) | from MWL                                                                                                             |
| Pregnancy Status                            | (0010,21C0) | from MWL                                                                                                             |
| Last Menstrual Date                         | (0010,21D0) | from MWL                                                                                                             |
| Patient Comments                            | (0010,4000) | from MWL or user input                                                                                               |
| Body Part Examined                          | (0018,0015) | zero-length                                                                                                          |
| KVP                                         | (0018,0060) |                                                                                                                      |
| Device Serial Number                        | (0018,1000) | from configuration                                                                                                   |
| Software Version (s)                        | (0018,1020) |                                                                                                                      |
| Protocol Name                               | (0018,1030) | same as "Series Description"                                                                                         |
| Distance Source to Detector                 | (0018,1110) |                                                                                                                      |
| Distance Source to Patient                  | (0018,1111) | only if anatomic measurement is activated                                                                            |
| Estimated Radiographic Magnification Factor | (0018,1114) | only if anatomic measurement is activated<br>= (0018,1110) / (0018,1111)                                             |
| Exposure Time                               | (0018,1150) |                                                                                                                      |
| X-Ray Tube Current                          | (0018,1151) |                                                                                                                      |
| Exposure                                    | (0018,1152) |                                                                                                                      |
| Exposure in $\mu$ As                        | (0018,1153) |                                                                                                                      |
| Image Area Dose Product                     | (0018,115E) |                                                                                                                      |
| Filter Type                                 | (0018,1160) | "NONE" or "CU_0.1_MM" or "CU_0.2_MM" or "CU_0.3_MM"                                                                  |
| Imager Pixel Spacing                        | (0018,1164) | "0.143", "0.143 "                                                                                                    |
| Grid                                        | (0018,1166) | "NONE" or "FOCUSED"                                                                                                  |
| Date of Last Calibration                    | (0018,1200) |                                                                                                                      |
| Acquisition Device Processing Description   | (0018,1400) | Diamond View Description                                                                                             |
| Acquisition Device Processing Code          | (0018,1401) | Diamond View Code                                                                                                    |
| Relative X-Ray Exposure                     | (0018,1405) | EXI value                                                                                                            |
| Tomo Layer Height                           | (0018,1460) | only for Tomography                                                                                                  |
| Tomo Angle                                  | (0018,1470) | only for Tomography                                                                                                  |
| Tomo Time                                   | (0018,1480) | only for Tomography                                                                                                  |
| Positioner Type                             | (0018,1508) |                                                                                                                      |
| Patient Position                            | (0018,5100) | see A.4.2                                                                                                            |
| View Position                               | (0018,5101) |                                                                                                                      |
| Sensitivity                                 | (0018,6000) |                                                                                                                      |
| Detector Conditions Nominal Flag            | (0018,7000) |                                                                                                                      |
| Detector Temperature                        | (0018,7001) |                                                                                                                      |
| Detector Type                               | (0018,7004) | "SCINTILLATOR"                                                                                                       |
| Detector Description                        | (0018,7006) | Detector Data:<br>- Factory Serial Number<br>- Factory Date Code<br>- Configuration Version<br>- Factory Part Number |
| Detector ID                                 | (0018,700A) | Factory Serial Number                                                                                                |
| Date of Last Detector Calibration           | (0018,700C) | same as "Date of Last Calibration"                                                                                   |

| Attribute Name                       | Tag         | Value                                                                                       |
|--------------------------------------|-------------|---------------------------------------------------------------------------------------------|
| Time of Last Detector Calibration    | (0018,700E) |                                                                                             |
| Grid Focal Distance                  | (0018,704C) | "1150" or "1500" or "1800" or "3000"                                                        |
| Private Data                         | (0019,xxxx) | see A.2.5                                                                                   |
| Study Instance UID                   | (0020,000D) | from MWL or created by system                                                               |
| Series Instance UID                  | (0020,000E) | created by system                                                                           |
| Study ID                             | (0020,0010) | from MWL or created by system                                                               |
| Series Number                        | (0020,0011) | unique within patient (1, 2, ...)                                                           |
| Acquisition Number                   | (0020,0012) | same as "Series Number"                                                                     |
| Instance Number                      | (0020,0013) | unique within series                                                                        |
| Patient Orientation                  | (0020,0020) | from organ program or user input                                                            |
| Image Laterality                     | (0020,0062) | from organ program or user input                                                            |
| Image Comments                       | (0020,4000) | from user input                                                                             |
| Private Data                         | (0021,xxxx) | see A.2.6                                                                                   |
| Private Data                         | (0025,xxxx) | see A.2.7                                                                                   |
| Samples per Pixel                    | (0028,0002) | 1                                                                                           |
| Photometric Interpretation           | (0028,0004) | "MONOCHROME2"                                                                               |
| Rows                                 | (0028,0010) | image size depends on collimation, max. 3072                                                |
| Columns                              | (0028,0011) | image size depends on collimation, max. 3072                                                |
| Pixel Spacing                        | (0028,0030) | only if configured in service UI<br>same as "Imager Pixel Spacing" (0018,1164)<br>see A.4.3 |
| Bits Allocated                       | (0028,0100) | 16                                                                                          |
| Bits Stored                          | (0028,0101) | 12                                                                                          |
| High Bit                             | (0028,0102) | 11                                                                                          |
| Pixel Representation                 | (0028,0103) | 0                                                                                           |
| Burned in Annotation                 | (0028,0301) | "NO"                                                                                        |
| Pixel Intensity Relationship         | (0028,1040) | "LIN"                                                                                       |
| Pixel Intensity Relationship Sign    | (0028,1041) | -1                                                                                          |
| Window Center                        | (0028,1050) |                                                                                             |
| Window Width                         | (0028,1051) |                                                                                             |
| Rescale Intercept                    | (0028,1052) | "0"                                                                                         |
| Rescale Slope                        | (0028,1053) | "1"                                                                                         |
| Rescale Type                         | (0028,1054) | "US"                                                                                        |
| Lossy Image Compression              | (0028,2110) |                                                                                             |
| Private Data                         | (0029,xxxx) | see A.2.1 to A.2.4                                                                          |
| Requesting Physician                 | (0032,1032) | from MWL                                                                                    |
| Requesting Service                   | (0032,1033) | from MWL                                                                                    |
| Request Description                  | (0032,1060) | from MWL                                                                                    |
| Requested Procedure Code Sequence    | (0032,1064) | from MWL                                                                                    |
| >Code Value                          | (0008,0100) |                                                                                             |
| >Coding Scheme Designator            | (0008,0102) |                                                                                             |
| >Coding Scheme Version               | (0008,0103) |                                                                                             |
| >Code Meaning                        | (0008,0104) |                                                                                             |
| Study Comments                       | (0032,4000) | from user input                                                                             |
| Special Needs                        | (0038,0050) | from MWL                                                                                    |
| Patient State                        | (0038,0500) | from MWL                                                                                    |
| Performed Procedure Step Start Date  | (0040,0244) | same as "Study Date" (0008,0020)                                                            |
| Performed Procedure Step Start Time  | (0040,0245) | same as "Study Time" (0008,0030)                                                            |
| Performed Procedure Step ID          | (0040,0253) | from MWL or created by system                                                               |
| Performed Procedure Step Description | (0040,0254) |                                                                                             |
| Performed Protocol Code Sequence     | (0040,0260) | from MWL or MPPS UI                                                                         |
| >Code Value                          | (0008,0100) |                                                                                             |
| >Coding Scheme Designator            | (0008,0102) |                                                                                             |
| >Coding Scheme Version               | (0008,0103) |                                                                                             |

| Attribute Name                                         | Tag         | Value                                       |
|--------------------------------------------------------|-------------|---------------------------------------------|
| >Code Meaning                                          | (0008,0104) |                                             |
| Request Attributes Sequence                            | (0040,0275) | from MWL                                    |
| >Scheduled Procedure Step Description                  | (0040,0007) |                                             |
| >Scheduled Protocol Code Sequence                      | (0040,0008) |                                             |
| >>Code Value                                           | (0008,0100) |                                             |
| >>Coding Scheme Designator                             | (0008,0102) |                                             |
| >>Coding Scheme Version                                | (0008,0103) |                                             |
| >>Code Meaning                                         | (0008,0104) |                                             |
| >Scheduled Procedure Step ID                           | (0040,0009) |                                             |
| >Requested Procedure ID                                | (0040,1001) |                                             |
| Acquisition Context Sequence                           | (0040,0555) | zero-length                                 |
| Confidentiality Constraint on Patient Data Description | (0040,3001) | from MWL                                    |
| Presentation LUT Shape                                 | (2050,0020) | "IDENTITY"                                  |
| Overlay Rows                                           | (60xx,0010) | same as "Rows" (0028,0010)                  |
| Overlay Columns                                        | (60xx,0011) | same as "Columns" (0028,0010)               |
| Number of Frames in Overlay                            | (60xx,0015) | 1 (if Overlay encoded in [60xx,3000])       |
| Overlay Description                                    | (60xx,0022) | "Siemens MedCom Object Graphics"            |
| Overlay Type                                           | (60xx,0040) | "G"                                         |
| Overlay Origin                                         | (60xx,0050) | 1\1                                         |
| Image Frame Origin                                     | (60xx,0051) | 1 (if Overlay encoded in [60xx,3000])       |
| Overlay Bits Allocated                                 | (60xx,0100) | 16 or 1 (if Overlay encoded in [60xx,3000]) |
| Overlay Bit Position                                   | (60xx,0102) | 12 or 0 (if Overlay encoded in [60xx,3000]) |
| Overlay Data                                           | [60xx,3000] | Graphics Overlay                            |
| Pixel Data                                             | (7FE0,0010) |                                             |

## A.7 Private Non-Image SOP Class

The AXIOM Aristos will create numerical data that cannot be correlated to an individual image instance and therefore need to be stored in separate instance(s). This is necessary to correlate the information in the right level of the DICOM data model hierarchy. Since there is no fitting DICOM SOP Class definition, SIEMENS has created a private "Non-Image IOD" to contain numerical data heaps to be managed within a DICOM structure. Please see previous chapters of the Appendix for IOD definition and the following tables for detailed encoding of the different "Non-Image SOP Class Instances".

### *"overview of supplied attributes – NON-image Exam Protocol"*

| Attribute Name                  | Tag         | Value                                         |
|---------------------------------|-------------|-----------------------------------------------|
| Specific Character Set          | (0008,0005) | (conf. Character Set is added, if needed)     |
| Image Type                      | (0008,0008) | "ORIGINAL\PRIMARY\SINGLE PLANE\EXAM PROTOCOL" |
| SOP Class UID                   | (0008,0016) | 1.3.12.2.1107.5.9.1                           |
| SOP Instance UID                | (0008,0018) |                                               |
| Study Date                      | (0008,0020) |                                               |
| Series Date                     | (0008,0021) |                                               |
| Study Time                      | (0008,0030) |                                               |
| Series Time                     | (0008,0031) |                                               |
| Accession Number                | (0008,0050) | from MWL or user input                        |
| Modality                        | (0008,0060) | CR or DX                                      |
| Referring Physician's Name      | (0008,0090) | from MWL or user input                        |
| Study Description               | (0008,1030) |                                               |
| Procedure Code Sequence         | (0008,1032) | from MWL                                      |
| >Code Value                     | (0008,0100) |                                               |
| >Coding Scheme Designator       | (0008,0102) |                                               |
| >Coding Scheme Version          | (0008,0103) |                                               |
| >Code Meaning                   | (0008,0104) |                                               |
| Series Description              | (0008,103E) | "EXAM PROTOCOL"                               |
| Physician(s) of Record          | (0008,1048) | from MWL                                      |
| Admitting Diagnoses Description | (0008,1080) | from MWL or user input                        |
| Referenced Study Sequence       | (0008,1110) | from MWL                                      |
| >Referenced SOP Class UID       | (0008,1150) |                                               |
| >Referenced SOP Instance UID    | (0008,1155) |                                               |
| Referenced Patient Sequence     | (0008,1120) | from MWL                                      |
| >Referenced SOP Class UID       | (0008,1150) |                                               |
| >Referenced SOP Instance UID    | (0008,1155) |                                               |
| Patient's Name                  | (0010,0010) | from MWL or user input                        |
| Patient ID                      | (0010,0020) | from MWL or user input                        |
| Patient's Birth Date            | (0010,0030) | from MWL or user input                        |
| Patient's Sex                   | (0010,0040) | from MWL or user input                        |
| Other Patient IDs               | (0010,1000) | from MWL                                      |
| Other Patient Names             | (0010,1001) | from MWL                                      |
| Patient's Age                   | (0010,1010) | calculated from (0010,0030) or user input     |
| Patient's Size                  | (0010,1020) | from MWL or user input                        |
| Patient's Weight                | (0010,1030) | from MWL or user input                        |
| Patient's Address               | (0010,1040) | from MWL or user input                        |
| Military Rank                   | (0010,1080) | from MWL or user input                        |
| Medical Alerts                  | (0010,2000) | from MWL                                      |
| Contrast Allergies              | (0010,2110) | from MWL                                      |
| Ethnic Group                    | (0010,2160) | from MWL or user input                        |
| Smoking Status                  | (0010,21A0) | from MWL                                      |

| Attribute Name                                         | Tag         | Value                         |
|--------------------------------------------------------|-------------|-------------------------------|
| Additional Patient History                             | (0010,21B0) | from MWL                      |
| Pregnancy Status                                       | (0010,21C0) | from MWL                      |
| Last Menstrual Date                                    | (0010,21D0) | from MWL                      |
| Patient Comments                                       | (0010,4000) | from MWL or user input        |
| Study Instance UID                                     | (0020,000D) | from MWL or created by system |
| Series Instance UID                                    | (0020,000E) | created by system             |
| Study ID                                               | (0020,0010) | from MWL or created by system |
| Series Number                                          | (0020,0011) | "999"                         |
| Private Data                                           | (0029,xxxx) | see A.2.1 to A.2.4            |
| Requesting Physician                                   | (0032,1032) | from MWL                      |
| Requesting Service                                     | (0032,1033) | from MWL                      |
| Request Description                                    | (0032,1060) | from MWL                      |
| Requested Procedure Code Sequence                      | (0032,1064) | from MWL                      |
| >Code Value                                            | (0008,0100) |                               |
| >Coding Scheme Designator                              | (0008,0102) |                               |
| >Coding Scheme Version                                 | (0008,0103) |                               |
| >Code Meaning                                          | (0008,0104) |                               |
| Special Needs                                          | (0038,0050) | from MWL                      |
| Patient State                                          | (0038,0500) | from MWL                      |
| Confidentiality Constraint on Patient Data Description | (0040,3001) | from MWL                      |
| Private Data                                           | (7FE1,0010) | see A.1.3.1                   |

## A.8 DICOM Print SCU – detailed status displays

The following tables document the behavior of the AXIOM Aristos DICOM Print AE in response to messages received for the printer SOP class and the print job SOP class.

Definitions of camera symbols:

- Idle: Camera is installed and ready; idle icon is displayed.
- Interact: The user has to react in near future, but not immediately.  
Example: A camera was low in 8x10 clear sheets: LOW 8x10 CLR was sent by n-event-report.
- Queue Stopped: The user has to react immediately. Either the camera needs immediate interaction or a job has been aborted.  
Example: A camera is out of 8x10 clear sheets, or camera is down, or a film job is aborted.

Note: different camera symbols are displayed according to the Printer Status Info.

The Printer Status (Success, Warning, Failure) is not evaluated, since the Printer Status Info is much more detailed and allows a more appropriate reaction of the system.

### A.8.1 Common Status Information

*“Common Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description                                                                                                                        | Message string visible<br>in 'Status Bar'                 | Other action for UI/<br>'camera symbol'                         |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------|
| NORMAL                                        | Camera is ready                                                                                                                    | Camera is ready                                           | <None>/idle                                                     |
| BAD RECEIVE MGZ                               | There is a problem with the film receive magazine. Films from the printer cannot be transported into the magazine.                 | Problem with receive magazine.                            | <None>/interact                                                 |
| BAD SUPPLY MGZ                                | There is a problem with the film supply magazine. Films from this magazine cannot be transported into the printer.                 | Problem with supply magazine.                             | <None>/interact                                                 |
| CALIBRATING                                   | Printer is performing self calibration, it is expected to be available for normal operation shortly.                               | Self calibration. Please wait.                            | <None>/idle                                                     |
| CALIBRATION ERR                               | An error in the printer calibration has been detected, quality of processed films may not be optimal.                              | Problem in calibration. Film quality may not be optimal.  | <None>/interact                                                 |
| CHECK CHEMISTRY                               | A problem with the processor chemicals has been detected, quality of processed films may not be optimal.                           | Problem with chemistry. Film quality may not be optimal.  | <None>/interact                                                 |
| CHECK SORTER                                  | There is an error in the film sorter                                                                                               | Error in film sorter.                                     | <None>/interact                                                 |
| CHEMICALS EMPTY                               | There are no processing chemicals in the processor, films will not be printed and processed until the processor is back to normal. | Camera chemistry empty. Please check.                     | <None>/interact                                                 |
| CHEMICALS LOW                                 | The chemical level in the processor is low, if not corrected, it will probably shut down soon.                                     | Camera chemistry low. Please check.                       | <None>/interact                                                 |
| COVER OPEN                                    | One or more printer or processor covers, drawers, doors are open.                                                                  | Camera cover, drawer or door open.                        | <None>/interact                                                 |
| ELEC CONFIG ERR                               | Printer configured improperly for this job.                                                                                        | Camera configured improperly for this job. Queue stopped. | <b>Queue for this camera will be STOPPED/<br/>Queue stopped</b> |
| ELEC DOWN                                     | Printer is not operating due to some unspecified electrical hardware problem.                                                      | Camera electrical hardware Problem.                       | <None>/interact                                                 |
| ELEC SW ERROR                                 | Printer not operating for some unspecified software error.                                                                         | Camera software problem. Queue stopped.                   | <b>Queue for this camera will be STOPPED/</b>                   |

| Printer Status Info/<br>Execution Status Info | Description                                         | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|-----------------------------------------------------|-------------------------------------------|-----------------------------------------|
|                                               |                                                     |                                           | Queue stopped                           |
| EMPTY 8x10                                    | The 8x10 inch film supply magazine is empty.        | 8x10 film supply empty.                   | <None>/interact                         |
| EMPTY 8x10 BLUE                               | The 8x10 inch blue film supply magazine is empty.   | 8x10 blue film supply empty.              | <None>/interact                         |
| EMPTY 8x10 CLR                                | The 8x10 inch clear film supply magazine is empty.  | 8x10 clear film supply empty.             | <None>/interact                         |
| EMPTY 8x10 PAPR                               | The 8x10 inch paper supply magazine is empty.       | 8x10 paper supply empty.                  | <None>/interact                         |
| EMPTY 10x12                                   | The 10x12 inch film supply magazine is empty.       | 10x12 film supply empty.                  | <None>/interact                         |
| EMPTY 10x12 BLUE                              | The 10x12 inch blue film supply magazine is empty.  | 10x12 blue film supply empty.             | <None>/interact                         |
| EMPTY 10x12 CLR                               | The 10x12 inch clear film supply magazine is empty. | 10x12 clear film supply empty.            | <None>/interact                         |
| EMPTY 10x12 PAPR                              | The 10x12 inch paper supply magazine is empty.      | 10x12 paper supply empty.                 | <None>/interact                         |
| EMPTY 10x14                                   | The 10x14 inch film supply magazine is empty.       | 10x14 film supply empty.                  | <None>/interact                         |
| EMPTY 10x14 BLUE                              | The 10x14 inch blue film supply magazine is empty.  | 10x14 blue film supply empty.             | <None>/interact                         |
| EMPTY 10x14 CLR                               | The 10x14 inch clear film supply magazine is empty. | 10x14 clear film supply empty.            | <None>/interact                         |
| EMPTY 10x14 PAPR                              | The 10x14 inch paper supply magazine is empty.      | 10x14 paper supply empty.                 | <None>/interact                         |
| EMPTY 11x14                                   | The 11x14 inch film supply magazine is empty.       | 11x14 film supply empty.                  | <None>/interact                         |
| EMPTY 11x14 BLUE                              | The 11x14 inch blue film supply magazine is empty.  | 11x14 blue film supply empty.             | <None>/interact                         |
| EMPTY 11x14 CLR                               | The 11x14 inch clear film supply magazine is empty. | 11x14 clear film supply empty.            | <None>/interact                         |
| EMPTY 11x14 PAPR                              | The 11x14 inch paper supply magazine is empty.      | 11x14 paper supply empty.                 | <None>/interact                         |
| EMPTY 14x14                                   | The 14x14 inch film supply magazine is empty.       | 14x14 film supply empty.                  | <None>/interact                         |
| EMPTY 14x14 BLUE                              | The 14x14 inch blue film supply magazine is empty.  | 14x14 blue film supply empty.             | <None>/interact                         |
| EMPTY 14x14 CLR                               | The 14x14 inch clear film supply magazine is empty. | 14x14 clear film supply empty.            | <None>/interact                         |
| EMPTY 14x14 PAPR                              | The 14x14 inch paper supply magazine is empty.      | 14x14 paper supply empty.                 | <None>/interact                         |
| EMPTY 14x17                                   | The 14x17 inch film supply magazine is empty.       | 14x17 film supply empty.                  | <None>/interact                         |
| EMPTY 14x17 BLUE                              | The 14x17 inch blue film supply magazine is empty.  | 14x17 blue film supply empty.             | <None>/interact                         |
| EMPTY 14x17 CLR                               | The 14x17 inch clear film supply magazine is empty. | 14x17 clear film supply empty.            | <None>/interact                         |
| EMPTY 14x17 PAPR                              | The 14x17 inch paper supply magazine is empty.      | 14x17 paper supply empty.                 | <None>/interact                         |
| EMPTY 24x24                                   | The 24x24 inch film supply magazine is empty.       | 24x24 film supply empty.                  | <None>/interact                         |
| EMPTY 24x24 BLUE                              | The 24x24 inch blue film supply magazine is empty.  | 24x24 blue film supply empty.             | <None>/interact                         |
| EMPTY 24x24 CLR                               | The 24x24 inch clear film supply magazine is empty. | 24x24 clear film supply empty.            | <None>/interact                         |
| EMPTY 24x24 PAPR                              | The 24x24 inch paper supply magazine is empty.      | 24x24 paper supply empty.                 | <None>/interact                         |
| EMPTY 24x30                                   | The 24x30 inch film supply magazine is empty.       | 24x30 film supply empty.                  | <None>/interact                         |
| EMPTY 24x30 BLUE                              | The 24x30 inch blue film supply magazine is empty.  | 24x30 blue film supply empty.             | <None>/interact                         |
| EMPTY 24x30 CLR                               | The 24x30 inch clear film supply magazine is empty. | 24x30 clear film supply empty.            | <None>/interact                         |
| EMPTY 24x30 PAPR                              | The 24x30 inch paper supply magazine is empty.      | 24x30 paper supply empty.                 | <None>/interact                         |
| EMPTY A4 PAPR                                 | The A4 paper supply magazine is empty.              | A4 paper supply empty                     | <None>/interact                         |
| EMPTY A4 TRANS                                | The A4 transparency supply magazine is empty.       | A4 transparency supply empty.             | <None>/interact                         |

| Printer Status Info/<br>Execution Status Info | Description                                                                           | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------|
| EXPOSURE FAILURE                              | The exposure device has failed due to some unspecified reason.                        | Exposure device has failed.               | <None>/interact                         |
| FILM JAM                                      | A film transport error has occurred and a film is jammed in the printer or processor. | Film jam.                                 | <None>/interact                         |
| FILM TRANSP ERR                               | There is a malfunction with the film transport, there may or may not be a film jam.   | Film transport problem.                   | <None>/interact                         |
| FINISHER EMPTY                                | The finisher is empty.                                                                | Finisher is empty.                        | <None>/interact                         |
| FINISHER ERROR                                | The finisher is not operating due to some unspecified reason                          | Finisher problem.                         | <None>/interact                         |
| FINISHER LOW                                  | The finisher is low on supplies.                                                      | Finisher low.                             | <None>/interact                         |
| LOW 8x10                                      | The 8x10 inch film supply magazine is low.                                            | 8x10 film supply low.                     | <None>/interact                         |
| LOW 8x10 BLUE                                 | The 8x10 inch blue film supply magazine is low.                                       | 8x10 blue film supply low.                | <None>/interact                         |
| LOW 8x10 CLR                                  | The 8x10 inch clear film supply magazine is low.                                      | 8x10 clear film supply low.               | <None>/interact                         |
| LOW 8x10 PAPR                                 | The 8x10 inch paper supply magazine is low.                                           | 8x10 paper supply low.                    | <None>/interact                         |
| LOW 10x12                                     | The 10x12 inch film supply magazine is low.                                           | 10x12 film supply low.                    | <None>/interact                         |
| LOW 10x12 BLUE                                | The 10x12 inch blue film supply magazine is low.                                      | 10x12 blue film supply low.               | <None>/interact                         |
| LOW 10x12 CLR                                 | The 10x12 inch clear film supply magazine is low.                                     | 10x12 clear film supply low.              | <None>/interact                         |
| LOW 10x12 PAPR                                | The 10x12 inch paper supply magazine is low.                                          | 10x12 paper supply low.                   | <None>/interact                         |
| LOW 10x14                                     | The 10x14 inch film supply magazine is low.                                           | 10x14 film supply low.                    | <None>/interact                         |
| LOW 10x14 BLUE                                | The 10x14 inch blue film supply magazine is low.                                      | 10x14 blue film supply low.               | <None>/interact                         |
| LOW 10x14 CLR                                 | The 10x14 inch clear film supply magazine is low.                                     | 10x14 clear film supply low.              | <None>/interact                         |
| LOW 10x14 PAPR                                | The 10x14 inch paper supply magazine is low.                                          | 10x14 paper supply low.                   | <None>/interact                         |
| LOW 11x14                                     | The 11x14 inch film supply magazine is low.                                           | 11x14 film supply low.                    | <None>/interact                         |
| LOW 11x14 BLUE                                | The 11x14 inch blue film supply magazine is low.                                      | 11x14 blue film supply low.               | <None>/interact                         |
| LOW 11x14 CLR                                 | The 11x14 inch clear film supply magazine is low.                                     | 11x14 clear film supply low.              | <None>/interact                         |
| LOW 11x14 PAPR                                | The 11x14 inch paper supply magazine is low.                                          | 11x14 paper supply low.                   | <None>/interact                         |
| LOW 14x14                                     | The 14x14 inch film supply magazine is low.                                           | 14x14 film supply low.                    | <None>/interact                         |
| LOW 14x14 BLUE                                | The 14x14 inch blue film supply magazine is low.                                      | 14x14 blue film supply low.               | <None>/interact                         |
| LOW 14x14 CLR                                 | The 14x14 inch clear film supply magazine is low.                                     | 14x14 clear film supply low.              | <None>/interact                         |
| LOW 14x14 PAPR                                | The 14x14 inch paper supply magazine is low.                                          | 14x14 paper supply low.                   | <None>/interact                         |
| LOW 14x17                                     | The 14x17 inch film supply magazine is low.                                           | 14x17 film supply low.                    | <None>/interact                         |
| LOW 14x17 BLUE                                | The 14x17 inch blue film supply magazine is low.                                      | 14x17 blue film supply low.               | <None>/interact                         |
| LOW 14x17 CLR                                 | The 14x17 inch clear film supply magazine is low.                                     | 14x17 clear film supply low.              | <None>/interact                         |
| LOW 14x17 PAPR                                | The 14x17 inch paper supply magazine is low.                                          | 14x17 paper supply low.                   | <None>/interact                         |
| LOW 24x24                                     | The 24x24 inch film supply magazine is low.                                           | 24x24 film supply low.                    | <None>/interact                         |
| LOW 24x24 BLUE                                | The 24x24 inch blue film supply magazine is low.                                      | 24x24 blue film supply low.               | <None>/interact                         |
| LOW 24x24 CLR                                 | The 24x24 inch clear film supply magazine is low.                                     | 24x24 clear film supply low.              | <None>/interact                         |
| LOW 24x24 PAPR                                | The 24x24 inch paper supply magazine is low.                                          | 24x24 paper supply low.                   | <None>/interact                         |
| LOW 24x30                                     | The 24x30 inch film supply magazine is                                                | 24x30 film supply low.                    | <None>/interact                         |

| Printer Status Info/<br>Execution Status Info | Description                                                                                                                                         | Message string visible<br>in 'Status Bar'                                | Other action for UI/<br>'camera symbol'                     |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------|
|                                               | low.                                                                                                                                                |                                                                          |                                                             |
| LOW 24x30 BLUE                                | The 24x30 inch blue film supply magazine is low.                                                                                                    | 24x30 blue film supply low.                                              | <None>/interact                                             |
| LOW 24x30 CLR                                 | The 24x30 inch clear film supply magazine is low.                                                                                                   | 24x30 clear film supply low.                                             | <None>/interact                                             |
| LOW 24x30 PAPER                               | The 24x30 inch paper supply magazine is low.                                                                                                        | 24x30 paper supply low.                                                  | <None>/interact                                             |
| LOW A4 PAPER                                  | The A4 paper supply magazine is low.                                                                                                                | A4 paper supply low.                                                     | <None>/interact                                             |
| LOW A4 TRANS                                  | The A4 transparency supply magazine is low..                                                                                                        | A4 transparency supply low.                                              | <None>/interact                                             |
| NO RECEIVE MGZ                                | The film receive magazine is not available.                                                                                                         | Film receiver not available.                                             | <None>/interact                                             |
| NO RIBBON                                     | The ribbon cartridge needs to be replaced.                                                                                                          | Replace ribbon cartridge.                                                | <None>/interact                                             |
| NO SUPPLY MGZ                                 | The film supply magazine is not available.                                                                                                          | Film supply not available.                                               | <None>/interact                                             |
| CHECK PRINTER                                 | The printer is not ready at this time, operator intervention is required to make the printer available.                                             | Check camera.                                                            | <None>/interact                                             |
| CHECK PROC                                    | The processor is not ready at this time, operator intervention is required to make the printer available.                                           | Check processor.                                                         | <None>/interact                                             |
| PRINTER DOWN                                  | The printer is not operating due to some unspecified reason.                                                                                        | Camera down.                                                             | <None>/interact                                             |
| PRINTER INIT                                  | The printer is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state.   | Camera initializing.                                                     | <None>/Idle                                                 |
| PRINTER OFFLINE                               | The printer has been disabled by an operator or service person.                                                                                     | Camera off-line.                                                         | <None>/interact                                             |
| PROC DOWN                                     | The processor is not operating due to some unspecified reason.                                                                                      | Processor down.                                                          | <None>/interact                                             |
| PROC INIT                                     | The processor is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state. | Processor initializing.                                                  | <None>/Idle                                                 |
| PROC OVERFLOW FL                              | Processor chemicals are approaching the overflow full mark.                                                                                         | Processor chemicals near overflow.                                       | <None>/interact                                             |
| PROC OVERFLOW HI                              | Processor chemicals have reached the overflow full mark.                                                                                            | Processor chemicals overflow.                                            | <None>/interact                                             |
| QUEUED                                        | Print job in Queue                                                                                                                                  | --                                                                       | <None>/Idle                                                 |
| RECEIVER FULL                                 | The film receive magazine is full.                                                                                                                  | Receiver full.                                                           | <None>/interact                                             |
| REQ MED NOT INST                              | The requested film, paper, or other media supply magazine is installed in the printer, but may be available with operator intervention.             | Install media supply.                                                    | <None>/interact                                             |
| REQ MED NOT AVAI                              | The requested film, paper, or other media requested is not available on this printer.                                                               | Media supply not available on this camera. Queue stopped. Change camera. | <b>Queue for this camera will be STOPPED/ Queue stopped</b> |
| RIBBON ERROR                                  | There is an unspecified problem with the print ribbon.                                                                                              | Error with print ribbon.                                                 | <None>/interact                                             |
| SUPPLY EMPTY                                  | The printer is out of film.                                                                                                                         | Camera out of film.                                                      | <None>/interact                                             |
| SUPPLY LOW                                    | The film supply is low.                                                                                                                             | Film supply low.                                                         | <None>/interact                                             |
| UNKNOWN                                       | There is an unspecified problem.                                                                                                                    | Unspecified problem with camera.                                         | <None>/interact                                             |

### A.8.2 Additional Status Information – AGFA printers

#### *“Additional Agfa printer Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description                                                                        | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------|
| WARMING UP                                    | Printer is in the warm-up stage. Spooling of print jobs to disk is still possible. | Camera is warming up.                     | <None>/idle                             |

| Printer Status Info/<br>Execution Status Info | Description                                                                                                      | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------|
| OFFLINE                                       | OFFLINE Printer is switched off-line. Spooling of print jobs to disk is still possible.                          | Camera is switched off-line.              | <None>/interact                         |
| NONE                                          | General printer warning, no specific information is available. Spooling of print jobs to disk is still possible. | --                                        | <None>/idle                             |

### A.8.3 Additional Status Information – Kodak PACS Link 9410 (formerly Imation)

*“Additional Kodak PACS Link 9410 (Imation) printer Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description                       | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|-----------------------------------|-------------------------------------------|-----------------------------------------|
| SUPPLY MGZ ERR                                | The supply magazine has an error. | Film supply has an error.                 | <None>/interact                         |

### A.8.4 Additional Status Information – Kodak 190

*“Additional Kodak 190 printer Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description              | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol'                 |
|-----------------------------------------------|--------------------------|-------------------------------------------|---------------------------------------------------------|
| PRINTER STOPPED                               | The printer has stopped. | Camera has stopped.                       | <None>/interact                                         |
| FATAL ERROR                                   | Fatal Error.             | Fatal Error. Queue stopped.               | Queue for this camera will be STOPPED/<br>Queue stopped |

### A.8.5 Additional Status Information – Kodak 2180/1120

*“Additional Kodak 2180/1120 printer Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description        | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol'                 |
|-----------------------------------------------|--------------------|-------------------------------------------|---------------------------------------------------------|
| PRINTER NOT RDY                               | Printer not ready. | Camera not ready..                        | <None>/interact                                         |
| CHECK PROCESSOR                               | Check processor.   | Check processor.                          | <None>/interact                                         |
| NO TONER                                      | No toner.          | No toner.                                 | <None>/interact                                         |
| FATAL                                         | Fatal Error.       | Fatal Error. Queue stopped.               | Queue for this camera will be STOPPED/<br>Queue stopped |

### A.8.6 Additional Status Information – Codonics

*“Additional Codonics printer Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description                        | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|------------------------------------|-------------------------------------------|-----------------------------------------|
| STANDARD                                      | Printer is ready.                  | Camera is ready.                          | <None>/Normal                           |
| LOAD A-SIZE                                   | Load A-Size media.                 | Load A-Size media.                        | <None>/interact                         |
| LOAD A-DVPAPER                                | Load A-Size black and white paper. | Load A-Size black and white paper.        | <None>/interact                         |
| LOAD A-CVPAPER                                | Load A-Size color paper.           | Load A-Size color paper.                  | <None>/interact                         |
| LOAD A-CVTRANS                                | Load A-Size transparencies.        | Load A-Size transparencies.               | <None>/interact                         |
| LOAD A4-SIZE                                  | Load A4-Size media.                | Load A4-Size media.                       | <None>/interact                         |

| Printer Status Info/<br>Execution Status Info | Description                                                       | Message string visible<br>in 'Status Bar' | Other action for UI/<br>'camera symbol' |
|-----------------------------------------------|-------------------------------------------------------------------|-------------------------------------------|-----------------------------------------|
| LOAD A4-DVPAPER                               | Load A4-Size black and white paper.                               | Load A4-Size black and white paper.       | <None>/interact                         |
| LOAD A4-CVPAPER                               | Load A4-Size color paper.                                         | Load A4-Size color paper.                 | <None>/interact                         |
| LOAD A4-CVTRANS                               | Load A4-Size transparencies.                                      | Load A4-Size transparencies.              | <None>/interact                         |
| LOAD LA-SIZE                                  | Load LA-Size media.                                               | Load LA-Size media.                       | <None>/interact                         |
| LOAD LA-DVPAPER                               | Load LA-Size black and white paper.                               | Load LA-Size black and white paper.       | <None>/interact                         |
| LOAD LA-CVPAPER                               | Load LA-Size color paper.                                         | Load LA-Size color paper.                 | <None>/interact                         |
| LOAD LA-CVTRANS                               | Load LA-Size transparencies.                                      | Load LA-Size transparencies.              | <None>/interact                         |
| LOAD LA4-SIZE                                 | Load LA4-Size media.                                              | Load LA4-Size media.                      | <None>/interact                         |
| LOAD LA4-DVPAPER                              | Load LA4-Size black and white paper.                              | Load LA4-Size black and white paper.      | <None>/interact                         |
| LOAD LA4-CVPAPER                              | Load LA4-Size color paper.                                        | Load LA4-Size color paper.                | <None>/interact                         |
| LOAD LA4-CVTRANS                              | Load LA4-Size transparencies.                                     | Load LA4-Size transparencies.             | <None>/interact                         |
| LOAD XLA-SIZE                                 | Load XLA-Size media.                                              | Load XLA-Size media.                      | <None>/interact                         |
| LOAD XLA-DVPAPER                              | Load XLA-Size black and white paper.                              | Load XLA-Size black and white paper.      | <None>/interact                         |
| LOAD XLA-CVPAPER                              | Load XLA-Size color paper.                                        | Load XLA-Size color paper.                | <None>/interact                         |
| LOAD XLA-CVTRANS                              | Load XLA-Size transparencies.                                     | Load XLA-Size transparencies.             | <None>/interact                         |
| LOAD XLA4-SIZE                                | Load XLA4-Size media.                                             | Load XLA4-Size media.                     | <None>/interact                         |
| LOAD XLA4-DVPAPER                             | Load XLA4-Size black and white paper.                             | Load XLA4-Size black and white paper.     | <None>/interact                         |
| LOAD XLA4-CVPAPER                             | Load XLA4-Size color paper.                                       | Load XLA4-Size color paper.               | <None>/interact                         |
| LOAD XLA4-CVTRANS                             | Load XLA4-Size transparencies.                                    | Load XLA4-Size transparencies.            | <None>/interact                         |
| LOAD XLW-SIZE                                 | Load XLW-Size media.                                              | Load XLW-Size media.                      | <None>/interact                         |
| LOAD XLW-DVPAPER                              | Load XLW-Size black and white paper.                              | Load XLW-Size black and white paper.      | <None>/interact                         |
| LOAD XLW-CVPAPER                              | Load XLW-Size color paper.                                        | Load XLW-Size color paper.                | <None>/interact                         |
| LOAD 8X10-SIZE                                | Load 8x10 media.                                                  | Load 8x10 media.                          | <None>/interact                         |
| LOAD 8X10-DVFILM                              | Load XLW-Size black and white film.                               | Load XLW-Size black and white film.       | <None>/interact                         |
| SUPPLY MISSING                                | The film supply magazine specified for this job is not available. | Film supply not available.                | <None>/interact                         |
| RIBBON MISSING                                | Ribbon is missing.                                                | Ribbon is missing.                        | <None>/interact                         |
| RIBBON EMPTY                                  | Ribbon is empty.                                                  | Ribbon is empty.                          | <None>/interact                         |
| TOP COVER OPEN                                | Top cover of printer is open.                                     | Top cover of camera is open.              | <None>/interact                         |

**A.8.7 Additional DICOM Execution Status Information***“Additional DICOM Execution Status Info evaluation”*

| Printer Status Info/<br>Execution Status Info | Description                                                                                                      | Message string visible<br>in 'Status Bar'                                                     | Other action for UI/<br>'camera symbol'                         |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| INVALID PAGE DES                              | The specified page layout cannot be printed or other page description errors have been detected.                 | Film Job cannot be printed on this camera. Queue stopped. Please redirect film job.           | <b>Queue for this camera will be STOPPED/<br/>Queue stopped</b> |
| INSUFFICIENT MEMORY                           | There is not enough memory available to complete this job.                                                       | Not enough memory available in camera. Queue stopped. Please continue queue or change camera. | <b>Queue for this camera will be STOPPED/<br/>Queue stopped</b> |
| NONE                                          | General printer warning, no specific information is available. Spooling of print jobs to disk is still possible. | --                                                                                            | <None>/Idle                                                     |