

# **ACOM.PC 2.2**

## **DICOM Conformance Statement**

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## **1 Introduction**

### **1.1 Purpose**

This DICOM Conformance Statement (DCS) is written according to part PS 3.2 of [1].

The applications described in this conformance statement are the Siemens implementation of the Basic Cardiac X-Ray Application Profile [2] and the Dynamic Cardio Review Augmented Application Profile [3] within the ACOM.PC product. The ACOM.PC DICOM network implementation acts as SCU for the Storage Service with the help of the ACOM.net server.

### **1.2 Definitions, Acronyms, and Abbreviations**

ACOM.PC	A PC-based cardiac review station developed and sold by Siemens Medical Systems that supports FSR (CD disc read).
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
DYNAVUE	Lossy, compressed image for faster viewing
FSR	File-set Reader
NEMA	National Electrical Manufacturers Association
SCP	DICOM Storage Class Provider
SCU	DICOM Service Class User (DICOM client)

### **1.3 References**

- [1] Digital Imaging and Communications in Medicine (DICOM) 3.0, NEMA PS 3.1-12, 1998
- [2] Basic Cardiac X-Ray Application Profile, Annex A, NEMA PS 3.11
- [3] Dynamic Cardio Review Augmented Application Profile, Version 1.1, July 7, 1995
- [4] Dynamic Cardio Review - Extension to the X-Ray Angiographic Image Object and Media Storage, Version 1.1, July 7, 1995

Note: Documents [3] and [4] were developed jointly by Siemens Medical Systems, Inc. and Philips Medical Systems, Nederland B.V.. They are available upon request.

### **1.4 Connectivity and Interoperability**

The implementation of the Siemens DICOM interface has been carefully tested to assure correspondence with this Conformance Statement. But the Conformance Statement and the DICOM standard do not guarantee interoperability of the Siemens modalities and modalities of other vendors. The user must compare the relevant Conformance Statements and if a successful interconnection should be possible, the user is responsible to specify an appropriate test suite and to validate the interoperability, which is required. A network environment may need additional functions out of the scope of DICOM.

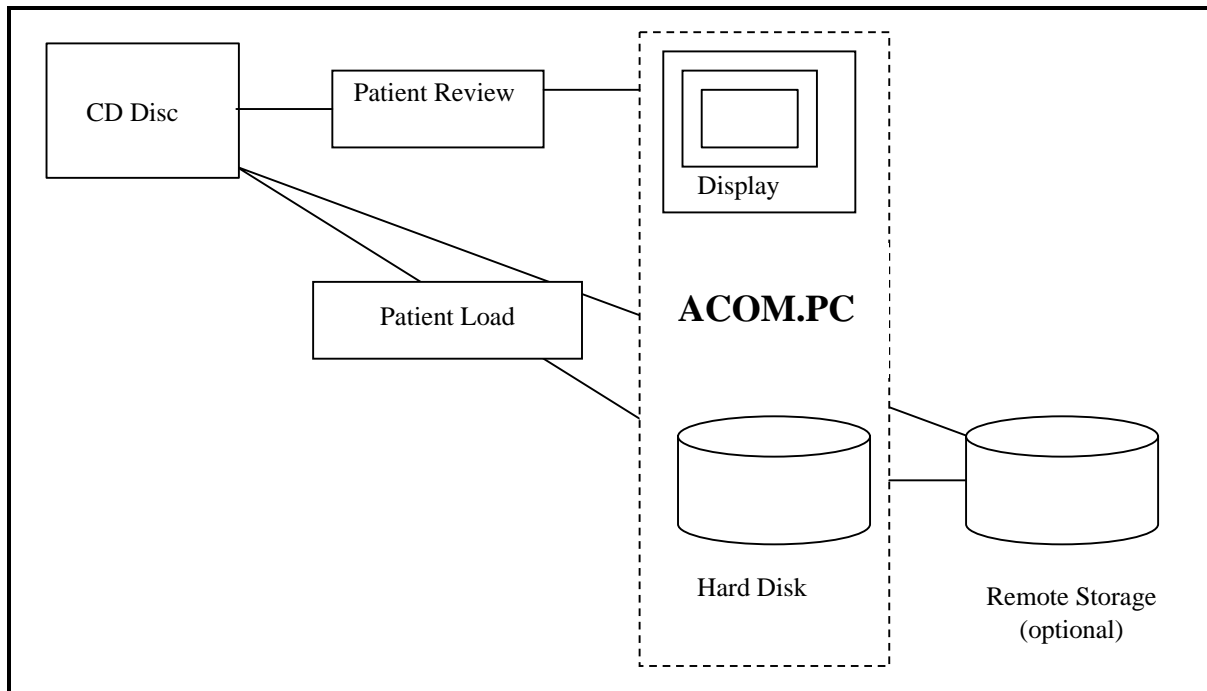
## 2 Implementation Model

The Siemens ACOM.net client modalities use the ACOM.net server to store DICOM Information Objects with the help of the ACOM.net protocol. The Server's DICOM Application Entity can be triggered to originate associations for Storage of DICOM Composite Information Objects to Remote Application Entities (AE). This could also be part of a Query/Retrieve service directed to the server by a Remote AE.

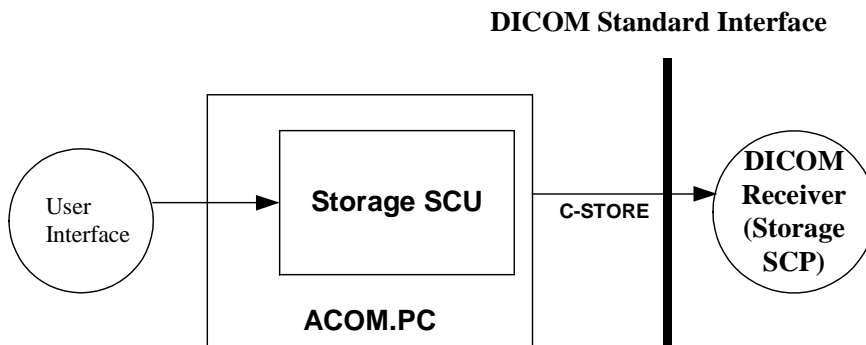
The ACOM.PC provides patient review from CD disk, patient load from CD. The ACOM.PC originates associations for Storage of DICOM Composite Information Objects in Remote Application Entities.

### 2.1 Application Data Flow Diagram

The ACOM.PC provides three Real World Activities - Patient Review, Patient Load and Frame Store.



The Patient Load Real World Activity – as an option – allows users to store images onto a Remote Storage System (ACOM.net Server) supporting the ACOM.net communication protocol.



## 2.2 Functional Definition of Application Entities

The ACOM.PC can perform the following functions:

### Patient Review:

ACOM.PC facilitates review of images from a CD Disc. ACOM.PC progresses to display the cardiac image runs and provides such image processing functions as decompression, window and level, spatial filtering, and zoom/roam. ACOM.PC also facilitates printing of images to standard laser printers as well as export of images in industry standard formats. Upon inserting CD disc into the ACOM.PC, a directory is provided that contains all of the images associated with the patient on the disc that conform to the Basic Cardiac X-Ray Application Profile. Any image within the directory can be selected for direct review from the CD disc.

### Patient Load:

Upon inserting a DICOM compliant CD in the ACOM.PC, a patient can be loaded onto a local or network hard drive. As an option, it is possible to export the images to the ACOM.net server as an additional target for image load.

### Frame Store:

During review of a scene in the ACOM.PC, a frame of the scene can be transferred via C-STORE to a DICOM Storage Class Provider (SCP). The frame is sent as an uncompressed, derived, secondary image (SC-IOD with modality type XA).

Only one destination can be configured at a time.

If ACOM.PC receives any other SCP response status than "Success" or "Warning", a notification to check for network problems will appear on the user interface. A response status of "Refused" will cause the ACOM.PC to retry an initiation of an association.

During the transmission of images to the remote node, a status box will be displayed. After completion, the status box disappears after the user acknowledges completion.

## 2.3 Sequencing Requirements

Not applicable.

### 3 AE Specifications

#### 3.1 CD Disc Application Specification

The ACOM.PC application provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in Table 3.1-1

**Table 3.1-1 Application Profiles, Activities, and Roles for the ACOM.PC**

Application Profiles Supported	Real World Activity	Role	SC Option
STD-XABC-CD	Patient Review	FSR	Interchange
STD-XA1K-CD	Patient Load	FSR	Interchange
AUG-XABC-DYNAMIC-CD			

#### 3.2 Association Establishment Policies

##### 3.2.1 General

The configuration of the ACOM.PC application defines the Application Entity Titles, the port numbers, and the host's name and net address.

##### 3.2.2 Number of Associations

The ACOM.PC initiates one association at a time for each transfer request being processed.

##### 3.2.3 Asynchronous Nature

The ACOM.PC software does not support asynchronous communication (multiple outstanding transactions over a single association).

#### 3.3 Real-World Activities for this Application Entity

##### 3.3.1 Real-World Activity: Patient Review

The ACOM.PC CD Disc Application acts as a FSR using the Interchange option when reviewing a patient's images from CD disc.

The ACOM.PC CD Disc Application presents those images on the CD disc that contains frames formatted to the Basic Cardiac X-Ray Application Profile (STD-XABC-CD). Data on a CD disc conforming to the Dynamic Cardio Review Augmented Application Profile (AUG-XABC-DYNAMIC-CD) can also be reviewed.

The ACOM.PC application displays information only about the first series of a study.

##### 3.3.1.1 Application Profiles for Patient Review

**Basic Cardiac X-Ray Application Profile (STD-XABC-CD):**

If the patient data on the CD disc only conforms to the Basic Cardiac X-Ray Application Profile then the first pass review rate for each image will be limited to approximately 15 frames/second depending upon the computer.

**Dynamic Cardio Review Augmented Application Profile (AUG-XABC-DYNAMIC-CD):**

If the patient data on the CD disc conforms to the Dynamic Cardio Review Augmented Application Profile in addition to the Basic Cardiac X-Ray Application Profile, then ACOM.PC can be configured to make use of either set of images to optimize review performance.

Value Precedence is supported when reviewing patients, see Appendix C for attributes supported.

**3.3.2 Real-World Activity: Patient Load**

The ACOM.PC CD Disc Application acts as a FSR using the Interchange option when loading a patient from CD disc.

Any CD disc containing patient demographic and image data conforming to the Basic Cardiac X-Ray Application Profile (STD-XABC-CD) with or without Dynamic Cardio Review Augmented Application Profile (AUG-XABC-DYNAMIC-CD) can be loaded onto another media (local/network hard drive or server) with ACOM.PC.

**3.3.2.1 Application Profiles for Patient Load****Basic Cardiac X-Ray Application Profile (STD-XABC-CD):**

If the patient data on the CD disc only conforms to the Basic Cardiac X-Ray Application Profile, then the ACOM.PC Application loads patient information onto the other media supported.

**Dynamic Cardio Review Augmented Application Profile (AUG-XABC-DYNAMIC-CD):**

If the patient data on the CD disc conforms to the Dynamic Cardio Review Augmented Application Profile in addition to the Basic Cardiac X-Ray Application Profile, then ACOM.PC Application loads the patient information onto the other media supported except the server. In that case, only the Basic Cardiac X-Ray information is moved.

Value Precedence is supported when loading patients, see Appendix C for attributes supported.

**3.3.3 Real World Activity: Frame Store**

The associated Real World activity is a C-STORE request initiated by the user. If the process successfully establishes an association to a remote Application Entity, it will transfer the selected frame via the open association. If the C-STORE Response from the remote Application contains a status other than Success the association is aborted. The operation can be restarted at any time by user interaction.

### 3.4 Presentation Context Table

**Presentation Context Table for Media Interchange**

Abstract Syntax		Transfer Syntax		Role
Name	UID	Name List	UID List	
X-Ray Angiographic	1.2.840.10008.5.1.4.1.1.12.1	JPEG Lossless	1.2.840.10008.1.2.4.70	FSR
		JPEG Lossy	1.2.840.10008.1.2.4.50	
		Implicit VR Little Endian	1.2.840.10008.1.2	
		Explicit VR Little Endian	1.2.840.10008.1.2.1	
Detached Patient Management	1.2.840.10008.3.1.2.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	FSR

**Presentation Context Table for Storage Service**

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	NONE
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

## 4 Augmented and Private Profiles

### 4.1 Augmented Profiles

As a FSR, the ACOM.PC CD Disc Application can read CD discs that conform to just the Basic Cardiac X-Ray Application Profile or to both the Basic Cardiac X-Ray Application Profile and the private extension defined in the Dynamic Cardio Review Augmented Application Profile.

### 4.2 Private Profiles

None



## **4.3 Communication Profiles**

### **4.3.1 Supported Communication Stacks**

The DICOM interface of the ACOM.PC provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

### **4.3.2 TCP/IP Stack**

The DICOM interface of the ACOM.PC uses the TCP/IP stack from the Windows NT 4.0 or Windows 98 operating system upon which it executes.

### **4.3.3 Physical Media Support**

The DICOM interface of the ACOM.PC is indifferent to the physical medium over which TCP/IP executes. It inherits this from the Windows operating system upon which it executes.

## **5 Extension, Specializations, Privatizations of SOP Classes and Transfer Syntaxes**

ACOM.PC utilizes the SOP class extension [4] created to support the Dynamic Cardio Review Augmented Application Profile.

## **6 Configuration**

### **6.1 Review**

The following attributes are configurable in the System Configuration menu on the CD Tab:  
CD Drive letter

The following options is configurable in the User Preferences menu:  
Use of Dynaview images (if available)

### **6.2 Storage**

The following attributes are configurable in the System Configuration menu on the Export Tab:  
Application Entity Title for ACOM.PC (Default: \_VIEWER)  
Application Entity Title for DICOM SCP (Default: MV50)  
Host Name (Default: 255.255.255.0)  
Host Port (Default: 104 - Must be a value between 0 and 1000)

## **7 Character Sets**

The ACOM.PC CD Application Profile supports the use of the Latin 1 character set (Specific Character Set = "ISO\_IR 100").

The ACOM.PC does not support the "[]" character. If that character is used in the patient name or physician name fields, the patient will not be displayed.

**Appendix A: X-Ray Angiographic Supported Attributes for Review**

Attribute Name	Tag	Notes
<b>Type 1</b>		
Specific Character Set	[0008, 0005]	
Image Type	[0008, 0008]	\ORIGINAL\PRIMARY\SINGLE PLANE or \ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A or \ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE B or \ORIGINAL\PRIMARY\BIPLANE A or \ORIGINAL\PRIMARY\BIPLANE B
SOP Class UID	[0008, 0016]	1.2.840.10008.5.1.4.1.1.12.1
SOP Instance UID	[0008, 0018]	
Modality	[0008, 0060]	Required for review
Reference Image Sequence	[0008, 1140]	Required for review for biplane
Reference SOP Class UID	[0008, 1150]	Required for review for biplane
Reference SOP Instance UID	[0008, 1155]	Required for review for biplane
Frame Time	[0018, 1063]	
Frame Time Vector	[0018, 1065]	
Radiation Setting	[0018, 1155]	
<i>The Shutter module is used only if a shutter shape is defined when the image is created.</i>		
Shutter Shape	[0018,1600]	CIRCULAR not supported
Left Vertical Edge	[0018,1602]	
Right Vertical Edge	[0018,1604]	
Upper Horizontal Edge	[0018,1606]	
Lower Horizontal Edge	[0018,1608]	
Vertices of Polygon	[0018,1620]	
<i>The Collimator module is used only if a collimator shape is defined when the image is created.</i>		
Collimator Shape	[0018,1700]	CIRCULAR not supported
Left Vertical Edge	[0018,1702]	
Right Vertical Edge	[0018,1704]	
Upper Horizontal Edge	[0018,1706]	
Lower Horizontal Edge	[0018,1708]	
Vertices of Polygon	[0018,1720]	
Study Instance UID	[0020, 000D]	
Series Instance UID	[0020, 000E]	

Samples per pixel	[0028, 0002]	
Photometric Interpretation	[0028, 0004]	MONOCHROME1 or MONOCHROME2
Number of frames	[0028, 0008]	Required for review
Frame Increment Pointer	[0028, 0009]	
Rows	[0028, 0010]	Required for review – supports through 1024
Columns	[0028, 0011]	Required for review – supports through 1024
Pixel Aspect Ratio	[0028, 0034]	
Bits Allocated	[0028, 0100]	8 or 16 - Required for review
Bits Stored	[0028, 0101]	8 or 10 - Required for review
High Bit	[0028, 0102]	7 or 9 (See Appendix D Table)
Pixel Representation	[0028, 0103]	0 (unsigned)
Pixel Intensity Relationship	[0028, 1040]	
Image Lossy Compression	[0028, 2110]	
Mask Subtraction Seq.	[0028, 6100]	
Mask Operation	[0028, 6101]	
Mask Frame Number	[0028, 6110]	
Pixel Data	[7FE0, 0010]	Required for review
<b>Type 2 and 3</b>		
Study Date	[0008, 0020]	
Series Date	[0008, 0021]	
Acquisition Date	[0008, 0022]	
Image Date	[0008, 0023]	
Study Time	[0008, 0030]	
Series Time	[0008, 0031]	
Acquisition Time	[0008, 0032]	
Image Time	[0008, 0033]	
Accession Number	[0008, 0050]	
Manufacturer	[0008, 0070]	
Institution Name	[0008, 0080]	
Study Description	[0008, 1030]	
Performing Physicians' Name	[0008, 1050]	
Patient's Name	[0010, 0010]	
Patient ID	[0010, 0020]	
Patient's Birth Date	[0010, 0030]	
Patient's Sex	[0010, 0040]	
Contrast/Bolus Agent	[0018, 0010]	
KVP	[0018,0060]	<peak KV used> (KV)
Table Motion	[0018,1134]	STATIC or DYNAMIC
Vertical Increment	[0018,1135]	(mm) <i>Only with DYNAMIC</i>
Lateral Increment	[0018,1136]	(mm) <i>Only with DYNAMIC</i>
Longitudinal Increment	[0018,1137]	(mm) <i>Only with DYNAMIC</i>
Exposure Time	[0018,1150]	<duration of X-Ray exposure> (msec)
X-Ray Tube Current	[0018,1151]	(mA)

Exposure	[0018,1152]	(mAs)
Positioner Motion	[0018, 1500]	DYNAMIC or STATIC
Positioner Primary Angle	[0018, 1510]	(degrees)
Positioner Secondary Angle	[0018, 1511]	(degrees)
Study ID	[0020, 0010]	
Series Number	[0020, 0011]	
Image Number	[0020, 0013]	Required for review
Image Comment	[0020, 4000]	
Window Center	[0028, 1050]	Required for review
Window Width	[0028, 1051]	Required for review
Recommend Viewing Mode	[0028, 1090]	
Representative Frame Num.	[0028, 6010]	
R-Wave Pointer	[0028, 6040]	
<b>Curve Data</b>		
Curve Dimensions	[50xx, 0005]	
Number of Points	[50xx, 0010]	
Type of Data	[50xx, 0020]	
Axis Units	[50xx, 0030]	
Data Value Presentation	[50xx, 0103]	
Maximum Coordinate Value	[50xx, 0104]	
Minimum Coordinate Value	[50xx, 0105]	
Curve Data Descriptor	[50xx, 0110]	
Coordinate Start Value	[50xx, 0112]	
Coordinate Step Value	[50xx, 0114]	
Curve Data	[50xx, 3000]	

**Appendix B: Secondary Capture Supported Attributes Created by ACOM.PC for Storage Services**

Table of Type 1 attributes.

<b>Attribute Name</b>	<b>Tag</b>	<b>Value</b>
Specific Character Set	[0008,0005]	ISO_IR 100 (Latin 1 alphabet)
Conversion Type	[0008,0064]	WSD
SOP Class UID	[0008,0016]	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	[0008,0018]	
Study Instance UID	[0020,000D]	
Series Instance UID	[0020,000E]	
Samples per Pixel	[0028,0002]	1
Photometric Interpretation	[0028,0004]	MONOCHROME2
Rows	[0028,0010]	512 or 1024
Columns	[0028,0011]	512 or 1024
Bits Allocated	[0028,0100]	8 or 16
Bits Stored	[0028,0101]	8 or 10
High Bit	[0028,0102]	7 or 9
Pixel Representation	[0028,0103]	0 (unsigned)
Pixel Data	[7FE0,0010]	

Table of Type 2/3 attributes

<b>Attribute Name</b>	<b>Tag</b>	<b>Value</b>
Image Type	[0008,0008]	DERIVED\SECONDARY
Study Date	[0008,0020]	<yyyymmdd>
Series Date	[0008,0021]	<yyyymmdd>
Acquisition Date	[0008,0022]	
Image Date	[0008,0023]	<yyyymmdd>
Study Time	[0008,0030]	<hhmmss>
Series Time	[0008,0031]	<hhmmss>
Acquisition Time	[0008,0032]	
Image Time	[0008,0033]	<hhmmss>
Accession Number	[0008,0050]	
Manufacturer	[0008,0070]	
Institution Name	[0008,0080]	
Study Description	[0008,1030]	
Performing Physicians' Name	[0008,1050]	
Patient's Name	[0010,0010]	
Patient ID	[0010,0020]	<max 64 char>
Patient's Birth Date	[0010,0030]	<yyyymmdd>
Patient's Sex	[0010,0040]	M or F or O
Secondary capture Device ID	[0018,1010]	ACOM.PC V2.2
Date of Secondary Capture	[0018,1012]	<yyyymmdd>
Time of Secondary Capture	[0018,1014]	<hhmmss>
Secondary Capture Device Manufacturer	[0018,1016]	SIEMENS Medical Systems Inc.
Secondary Capture Device Manufacturer's Model name	[0018,1018]	ACOM.PC V2.2
Secondary Capture Device Software Version	[0018,1019]	2.2
Study ID	[0020,0010]	

Series Number	[0020,0011]	
Image Number	[0020,0013]	
Image Comments	[0020,4000]	
Window Center	[0028,1050]	
Window Width	[0028,1051]	

**Appendix C: Detached Patient Information**

<b>Attribute Name</b>	<b>Tag</b>
Group Length	0002,0000
File Meta Information Version	0002,0001
Media Storage SOP Class UID	0002,0002
Media Storage SOP Instance UID	0002,0003
Transfer Syntax UID	0002,0010
Implementation Class UID	0002,0012
Source Application Entity Title	0002,0016
Specific Character Set	0008,0005
SOP Class UID	0008/0016
SOP Instance UID	0008,0018
Study Date	0008,0020
Study Time	0008,0030
Accession Number	0008,0050
Modality	0008,0060
Institution Name	0008,0080
Institution Address	0008,0081
Referring Physician's Name	0008,0090
Study Description	0008,1030
Performing Physician's Name	0008,1050
Patient's Name	0010,0010
Patient ID	0010,0020
Patient's Sex	0010,0040
Study Instance UID	0020,000D
Series Instance UID	0020,000E
Study ID	0020,0010
Series Number	0020,0011

**Appendix D: Support XA Image Formats**

<b>Matrix Size</b>	<b>Bits Stored</b>	<b>Format Supported</b>
512x512	8	Compressed
1024x1024	10	Compressed
<=1024x1024	8 or 10	Uncompressed