Ultrasonix Medical Corporation

DICOM CONFORMANCE STATEMENT

For Legacy SonixOP, SonixSP, SonixRP and SonixCEP
Diagnostic Ultrasound Systems

US Patents: 6,911,008 - 6,558,326 - 6,325,759 - 7,274,325

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CHAPTER 1: INTRODUCTION

This document is the DICOM 3.0 Conformance Statement for the SONIX diagnostic ultrasound systems.

The system conforms to the DICOM 3.0 standard to share medical information with other digital imaging systems. The SONIX system, by means of the DICOM protocol, communicates with Storage, Storage Commitment, Print and Modality Worklist Service Class Providers. The SONIX is capable of creating images that conform to the Composite Ultrasound Image IOD.

CHAPTER 2: IMPLEMENTATION MODEL

The SONIX exposes the DICOM 3.0 standard as an Image Storage SCU, a Storage Commitment SCU, an Image Printing SCU, and a Modality Worklist SCU.

2.1 APPLICATION DATA FLOW DIAGRAM

Figure 2-1 depicts the relationship between real-world activities and their corresponding local and remote Application Entities.

Figure 2-1: Implementation Model
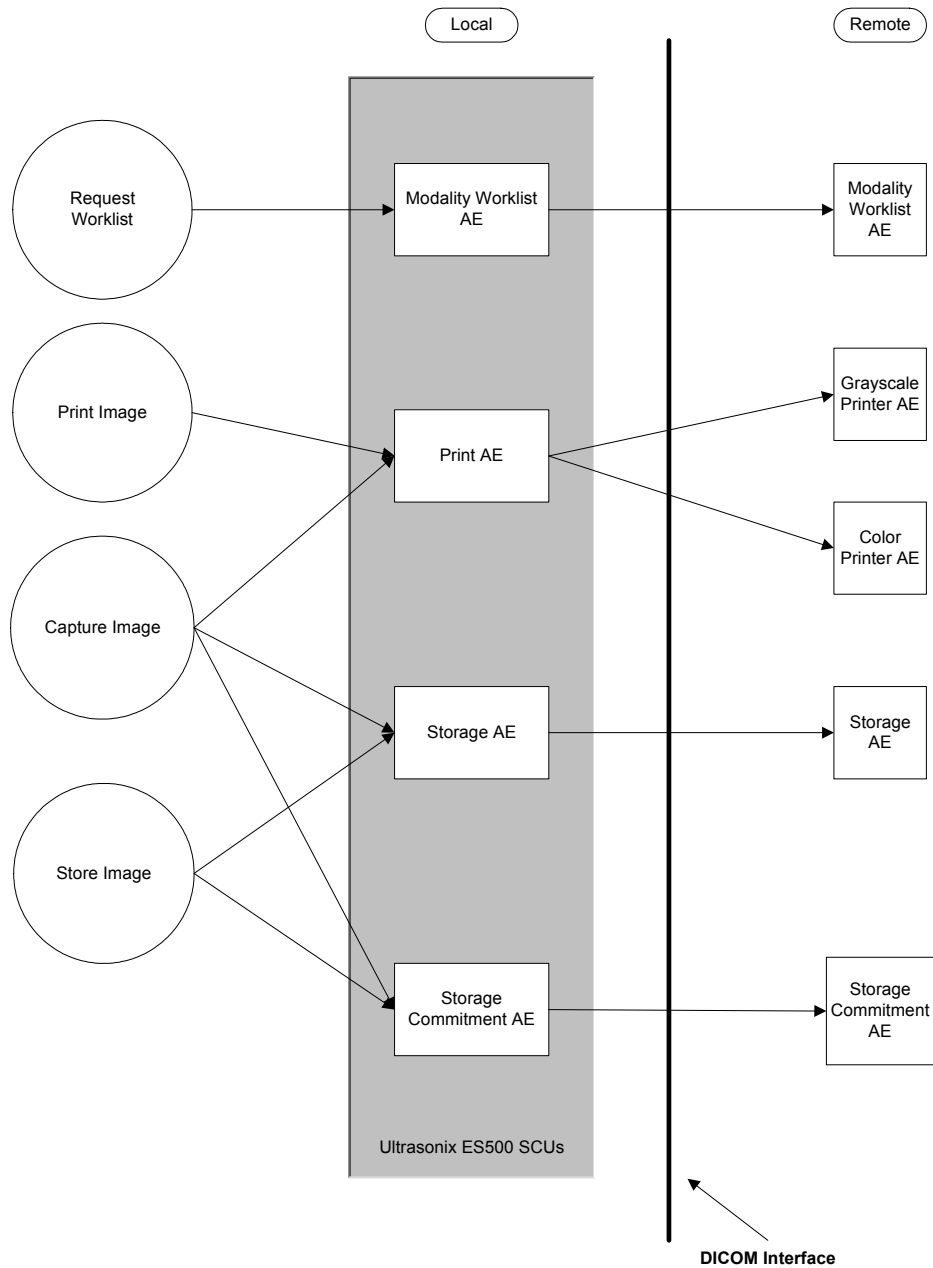
2.1.1 Request Worklist

The Modality Worklist can be retrieved by entering the New Patient Window and initiating a search. A search is started by selecting the Search button which then brings up a Search Criteria Window. In the Search Criteria Window the user can specify the following search parameters:

- A range of Scheduled Exam Dates
- Patient Name (first and last)
- Patient ID
- Accession Number
- Modality

These parameters are then used to query the Modality Worklist Server for matching patient records. All returned matching records are displayed in a selection list from which the user can select the patient to examine.

The patient list is limited to 200 records.

2.1.2 Print Image

Exams that have been completed can be printed at a later time by the user. In the Patient Archive Window the user can select which images from a selected study are to be sent to the DICOM Printer Server. From the Destination selection list DICOM Printer Server is selected. Once the Send button is clicked then the selected images are sent to the configured DICOM Printer Server.

2.1.3 Capture Image

During an Exam the user can capture images by using the Print Button on the System Console. Pressing the button causes the displayed image to be captured. This image is sent, if configured, to the DICOM Storage and DICOM Print Servers. The captured image is also stored locally on the hard disk so that it may be stored or printed at a later time.

2.1.4 Store Image

Exams that have been completed can be stored at a later time by the user. In the Patient Archive Window the user can select which images from a selected study are to be sent to the DICOM Storage Server. From the Destination selection list DICOM Storage Server is selected. Once the Send button is clicked then the selected images are sent to the configured DICOM Storage Server.

2.2 FUNCTIONAL DEFINITIONS OF AE'S

2.2.1 Storage

The Image Storage AE supports the DICOM Store Service as an SCU. This AE manages the transmission of DICOM ultrasound images to a DICOM Storage Server.

2.2.2 Print

The Print AE supports the DICOM Print Service as an SCU. This AE manages the transmission of DICOM ultrasound images to a DICOM Print Server.

2.2.3 Worklist

The Worklist AE supports the DICOM Basic Worklist Management Service as an SCU. This AE manages the retrieval of a worklist from a DICOM Worklist Server. A worklist satisfying a user specified query is retrieved from the server.

2.2.4 Storage Commitment

The Storage Commitment AE supports the DICOM Basic Worklist Management Service as an SCU. This AE manages the issuance of Storage Commitment Requests and the resulting Storage Commitment Status Responses. After each stored ultrasound image a corresponding Storage Commitment Request is also issued.

2.3 SEQUENCING OF REAL-WORLD ACTIVITIES

Not applicable.

CHAPTER 3: AE SPECIFICATIONS

3.1 IMAGE PRINTING AE - SPECIFICATION

The Image Printing AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 3-1: Image Printing AE SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Standard
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Standard
Basic Film Session	1.2.840.10008.5.1.1.1	Standard
Basic Film Box	1.2.840.10008.5.1.1.2	Standard
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Standard
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	Standard
Printer	1.2.840.10008.5.1.1.16	Standard

3.1.1 Association Establishment Policies

The Image Printing AE shall initiate an association when the user captures a full page of images. If an incomplete page of images exists when the user selects a new patient then an association is initiated. Also an association is initiated when the user manually print images.

After each page of images is printed then the association is immediately closed.

3.1.1.1 General

The default PDU size is 16,384 bytes. The PDU size is fully configurable by the user.

3.1.1.2 Number of Associations

The Image Printing AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Printing AE.

3.1.1.3 Asynchronous Nature

The Image Printing AE does not perform any asynchronous operations.

3.1.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the SONIX Software, *minor* equals the minor version number of the SONIX Software, and *build* equals the build number of the SONIX Software.

3.1.2 Association Initiation by: Real-World Activity

The Image Printing AE opens an association to a Print Server (Gray or Colour) when the user manually selects images to be printed, a full page of images is ready to be printed, or a new patient is selected.

3.1.2.1 Association Initiation by: Manual Print

The user can manually select previously acquired images and send them to a Print Server which invokes the opening of an association.

3.1.2.2 Association Initiation by: Full Image Page Acquired

Once the user has acquired a full page of images a new association is opened upon which the full image page is sent to the Print Server.

3.1.2.3 Association Initiation by: Select Patient

If the user selects a new patient (end study) and an incomplete sheet, exists then a new association is opened upon which the incomplete image sheet is sent to the Print Server.

3.1.3 Proposed Presentation Context to a Grayscale Print Server

The following list applies when SONIX is configured to print to a Grayscale Print Server:

Table 3-2: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	UID	Name	UID	Role	Extended Negotiation
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.3.1 SOP Specific Conformance to Basic Grayscale Print Management Meta SOP Class

Standard conformance is provided to the Basic Grayscale Print Management Meta SOP Classes as an SCU. Additionally the following SOP Classes are also supported:

Table 3-3: Grayscale Supported SOP Classes

SOP Class Name	SOP Class UID	Conformance Level
Basic Film Session	1.2.840.10008.5.1.1.1	Standard
Basic Film Box	1.2.840.10008.5.1.1.2	Standard
Basic Grayscale Image Box	1.2.840.10008.5.1.1.4	Standard
Printer	1.2.840.10008.5.1.1.16	Standard

All mandatory elements of these SOP Classes are supported.

3.1.3.2 SOP Specific Conformance: Basic Film Session SOP Class

Note: *All attributes not listed are not supported.*

Table 3-4: Optional Attributes Set for the Film Session SOP Class

Name	Tag	Range	Comment
Number of Copies	(2000,0010)	N	Any positive integer
Print Priority	(2000,0020)	HIGH MED LOW	
Medium Type	(2000,0030)	PAPER CLEAR FILM BLUE FILM	
Film Destination	(2000,0040)	MAGAZINE PROCESSOR	

3.1.3.3 SOP Specific Conformance: Basic Film Box SOP Class

Note: *All attributes not listed are not supported.*

Table 3-5: Optional Attributes Set for the Film Box SOP Class

Name	Tag	Range	Comment
Film Orientation	(2010,0040)	PORTRAIT LANDSCAPE	
Film Size ID	(2010,0050)	8INX10IN 10INX12IN 10INX14IN 11INX14IN 14INX14IN 14INX17IN 24CMX30CM 24CMX24CM	
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	
Smoothing Type	(2010,0080)	Printer specific	
Border Density	(2010,0100)	BLACK WHITE *n*	*n* represents the image density in hundredths of OD
Empty Image Density	(2010,0110)	BLACK WHITE *n*	*n* represents the image density in hundredths of OD
Min Density	(2010,0120)	*n*	*n* represents any positive integer
Max Density	(2010,0130)	*n*	*n* represents any positive integer
Trim	(2010,0140)	YES NO	
Configuration Information	(2010,0150)	Printer specific	

3.1.3.4 SOP Specific Conformance: Basic Grayscale Image Box SOP Class

Note: *All attributes not listed are not supported.*

Table 3-6: Optional Attributes Set for the Image Grayscale Box SOP Class

Name	Tag	Range	Comment
Image Position	(2020,0010)	*n*	n represents any positive integer
Basic Grayscale Image Sequence	(2020,0110)		
>Samples Per Pixel	(0028,0002)	1	
>Photometric Interpretation	(0028,0004)	MONOCHROME2	
>Rows	(0028,0010)	*n*	*n* represents any positive integer
>Columns	(0028,0011)	*n*	*n* represents any positive integer
>Bits Allocated	(0028,0100)	8	
>Bits Stored	(0028,0101)	8	
>High Bit	(0028,0102)	7	
>Pixel Representation	(0028,0103)	0	Unsigned integer.
>Pixel Data	(7FE0,0010)		
Polarity	(2020,0020)	NORMAL REVERSE	
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	This is always the same value as the Film Box's copy of the Magnification Type
Smoothing Type	(2010,0080)	Printer specific	This is always the same value as the Film Box's copy of the Smoothing Type
Requested Image Size	(2020,0030)	Printer specific	

3.1.3.5 SOP Specific Conformance: Printer SOP Class

All attributes not listed are not supported. The SONIX does not set these attributes; instead the Printer Server sets them and these are the attributes used by the SONIX.

Table 3-7: Optional Attributes Set for the Printer SOP Class

Name	Tag	Range	Comment
Printer Status	(2110,0010)	NORMAL WARNING FAILURE	
Printer Status Info	(2110,0020)	Printer specific	
Printer Name	(2020,0030)	Printer specific	
Manufacturer	(0008,0070)	Printer specific	
Manufacturer Model Name	(0008,1090)	Printer specific	
Device Serial Number	(0018,1000)	Printer specific	
Software Versions	(0018,1020)	Printer specific	
Date of Last Calibration	(0018,1200)	Printer specific	
Time of Last Calibration	(0018,1201)	Printer specific	

3.1.4 Proposed Presentation Context to a Color Print Server

The following list applies when SONIX is configured to print to a Color Print Server:

Table 3-8: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	**UID**	**Name**	**UID**	**Role**	**Extended Negotiation**
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.1.4.1 SOP Specific Conformance to Basic Color Print Management Meta SOP Class

Standard conformance is provided to the Basic Color Print Management Meta SOP Classes as an SCU. Additionally the following SOP Classes are also supported:

Table 3-9: Grayscale Supported SOP Classes

SOP Class Name	SOP Class UID	Conformance Level
Basic Film Session	1.2.840.10008.5.1.1.1	**Standard**
Basic Film Box	1.2.840.10008.5.1.1.2	**Standard**
Basic Color Image Box	1.2.840.10008.5.1.1.4.1	**Standard**
Printer	1.2.840.10008.5.1.1.16	**Standard**

The Basic Film Session, Basic Film Box and Printer SOP Classes used by the Color SOP Class are the same as those used by the Grayscale SOP Class. Only the Image Box SOP Class differs and its attributes are shown below.

3.1.4.2 SOP Specific Conformance: Basic Color Image Box SOP Class

Note: *All attributes not listed are not supported.*

Table 3-10: Optional Attributes Set for the Image Color Box SOP Class

Name	Tag	Range	Comment
Image Position	(2020,0010)	*n*	*n* represents any positive integer
Basic Color Image Sequence	(2020,0111)		
>Samples Per Pixel	(0028,0002)	3	
>Photometric Interpretation	(0028,0004)	RGB	
>Planar Configuration	(0028,0006)	0	
>Rows	(0028,0010)	*n*	*n* represents any positive integer
>Columns	(0028,0011)	*n*	*n* represents any positive integer
>Bits Allocated	(0028,0100)	8	
>Bits Stored	(0028,0101)	8	
>High Bit	(0028,0102)	7	
>Pixel Representation	(0028,0103)	0	Unsigned integer.
>Pixel Data	(7FE0,0010)		
Polarity	(2020,0020)	NORMAL REVERSE	
Magnification Type	(2010,0060)	REPLICATE BILINEAR CUBIC NONE	This is always the same value as the Film Box's copy of the Magnification Type
Smoothing Type	(2010,0080)	Printer specific	This is always the same value as the Film Box's copy of the Smoothing Type
Requested Image Size	(2020,0030)	Printer specific	

3.2 IMAGE STORAGE AE - SPECIFICATION

The Image Storage AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 3-11: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	**Standard**
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	**Standard**
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	**Standard**
US Multi-Frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	**Standard**

3.2.1 Association Establishment Policies

After an image is captured an association shall be initiated to transfer the image. Once the image has been transferred then the association is closed. If the image is unsuccessfully transferred then attempts to initiate and transfer the image shall be made periodically. The user can also manually select images to transfer to a Storage Server; an association is initiated when the user transfers these images.

3.2.1.1 General

The default PDU size is 16 384 bytes. The PDU size is fully configurable by the user.

3.2.1.2 Number of Associations

The Image Storage AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Storage AE.

3.2.1.3 Asynchronous Nature

The Image Storage AE does not perform any asynchronous operations.

3.2.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the SONIX Software, *minor* equals the minor version number of the SONIX Software, and *build* equals the build number of the SONIX Software.

3.2.2 Association Initiation by: Real-World Activity

The Image Storage AE initiates an association to a Storage Server when the user acquires an ultrasound image or a multi-frame ultrasound image or the user manually selects images to be sent to the Storage Server. Associations are initiated periodically to transfer images that were previously unsuccessfully transferred.

3.2.2.1 Association Initiation by: Manual Store

The user can manually select previously acquired images and send them to a Storage Server which invokes the opening of an association.

3.2.2.2 Association Initiation by: Image Acquired

Once the user has acquired an image or a multi-frame image a new association is opened upon which the image is sent to the Storage Server.

3.2.2.3 Association Initiation by: Storage Retry

Attempts to send images that where previously unsuccessfully transferred to a Storage Server are periodically made. Each attempt initiates an association.

3.2.3 Proposed Presentation Context to a Storage Server

The following list applies when SONIX is configured to print to a Grayscale Print Server:

Table 3-12: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	UID	Name	UID	Role	Extended Negotiation
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See **Table 3-13**	See	SCU	None
US Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	See **Table 3-13**	See	SCU	None
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See **Table 3-13**	See	SCU	None
US Multi-Frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	See **Table 3-13**	See	SCU	None

Table 3-13: Image Storage AE Supported Transfer Syntaxes

Name	UID
DICOM Implicit VR Little Endian	1.2.840.10008.1.2
DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1
JPEG Baseline (Process 1): Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50
JPEG Lossless (Process 14)	1.2.840.10008.1.2.4.57

3.2.3.1 SOP Specific Conformance to Ultrasound Image Storage SOP Class

A Patient Object retrieved by means of a Modality Worklist is used to fill specific Ultrasound Image IOD attributes. The attributes mapped from a Modality Worklist to an Ultrasound Image IOD are listed in Table 3-29 – **Table 3-35**.

The Image Storage AE creates Ultrasound Image and Ultrasound Multi-Frame IODs as follows:

Note: *All attributes not listed are not supported.*

Table 3-14: Significant Patient Module Attributes

Attribute Name	Tag ID	Comment
Patient Name	(0010,0010)	Always specified. Names are set using carat, '^', delimiters. Provided by MWL Server or manually entered by user.
Patient ID	(0010,0010)	Always specified. Provided by MWL Server or manually entered by user.
Patient's Birth Date	(0010,0030)	Always specified. Provided by MWL Server or manually entered by user.
Patient's Sex	(0010,0040)	Always specified. 'M', 'F', 'O' or *null*. Provided by MWL Server or manually entered by user.
Other Patient IDs	(0010,1000)	Provided by MWL Server, otherwise set to *null*. Not set for non-worklist.
Ethnic Group	(0010,2160)	Provided by MWL Server, otherwise set to *null*. Not set for non-worklist.
Patient Comments	(0010,4000)	Provided by MWL Server, otherwise set to *null*. Not set for non-worklist.

Table 3-15: Significant General Study Module Attributes

Attribute Name	Tag ID	Comment
Study Instance UID	(0020,000D)	Always Specified. Provided by MWL Server. Generated by system for non-worklist.
Study Date	(0008,0020)	Always specified.
Study Time	(0008,0030)	Always specified.
Referring Physician's Name	(0008,0090)	Always specified. Provided by MWL Server, otherwise set to *null*. Manually entered by user for non-worklist, otherwise set to *null*.
Study ID	(0020,0010)	Always specified.
Accession Number	(0008,0050)	Always specified. Provided by MWL Server, otherwise set to *null*. Manually entered by user for non-worklist, otherwise set to *null*.
Study Description	(0008,1030)	Always specified. Provided by MWL Server [Scheduled Procedure Step Description (0040,0007)], otherwise set to *null*. Manually entered by user for non-worklist, otherwise set to *null*.
Physician(s) of Record	(0008,1048)	Provided by MWL Server from Names of Intended Recipients of Results (0040,1010). Not set for non-worklist.

Table 3-16: Significant Patient Study Module Attributes

Attribute Name	Tag ID	Comment
Admitting Diagnosis Description	(0008,1080)	Provided by MWL Server, otherwise set to *null*. Not set for non-worklist.
Patient's Age	(0010,1010)	Calculated from Patient's Birth Date
Patient's Size	(0010,1020)	Always specified. Provided by MWL Server, otherwise set to *null*. Manually entered by user for non-worklist, otherwise set to *null*.
Patient's Weight	(0010,1030)	Always specified. Provided by MWL Server, otherwise set to *null*. Manually entered by user for non-worklist, otherwise set to *null*.
Additional Patient History	(0010,21B0)	Provided by MWL Server, otherwise set to *null*. Not set for non-worklist.

Table 3-17: Significant General Series Module Attributes

Attribute Name	Tag ID	Comment
Modality	(0008,0060)	Always US.
Series Instance UID	(0020,000E)	Always specified. One unique ID per study.
Series Number	(0020,0011)	Always specified.
Series Date	(0008,0021)	Always specified.
Series Time	(0008,0031)	Always specified.
Performing Physicians' Name	(0008,1050)	Always specified. Manually entered by user or provided by MWL Server from Scheduled Performing Physician's Name (0040,0006), otherwise set to *null*.
Series Description	(0008,103E)	Always specified. Provided by MWL Server [Scheduled Procedure Step Description (0040,0007)], otherwise set to *null*. Manually entered by user for non-worklist, otherwise set to generated by system.
Operator's Name	(0008,1070)	Always specified. Manually entered by user or provided by MWL Server from Scheduled Performing Physician's Name (0040,0006), otherwise set to *null*.

Table 3-18: Significant General Equipment Module Attributes

Attribute Name	Tag ID	Comment
Manufacturer	(0008,0070)	Always specified as "Ultrasonix Medical Corp."
Institution Name	(0008,0080)	Always specified.
Station Name	(0008,1010)	Provided by MWL Server, otherwise set to *null*. Not set for non-worklist.
Manufacturer's Model Name	(0008,1090)	Always specified as SONIX01
Device Serial Number	(0008,1000)	Always specified.
Software Versions	(0018,1020)	Always specified.

Table 3-19: Significant General Image Module Attributes

Attribute Name	Tag ID	Comment
Image Instance	(0020,0013)	Always specified. Unique within its Series.
Patient Orientation	(0020,0020)	Always set to *null*.
Content Date	(0008,0023)	Always specified.
Content Time	(0008,0033)	Always specified.
Image Type	(0008,0008)	Always specified as ORIGINAL/PRIMARY.
Derivation Description	(0008,2111)	Specified if the image is compressed.

Table 3-20: Significant Image Pixel Module Attributes

Attribute Name	Tag ID	Comment
Samples per pixel	(0028,0002)	Always specified as 3 for RGB and 1 for MONOCHROME2
Photometric Interpretation	(0028,0004)	Always specified. The following photometric interpretations can be specified: MONOCHROME2 for mono, RGB for color, and YBR_FULL_422 for compressed JPEG.
Rows	(0028,0010)	Always specified.
Columns	(0028,0011)	Always specified.
Bits Allocated	(0028,0100)	Always specified as 8.
Bits Stored	(0028,0101)	Always specified as 8.
High bit	(0028,0102)	Always specified as 7.
Pixel Representation	(0028,0103)	Always specified as 0, unsigned integer.
Pixel Data	(7FE0,0010)	Always specified.
Planar Configuration	(0028,0006)	Present if RGB. Always specified as Color-by-pixel (0).

Table 3-21: Significant Cine Module Attributes

Attribute Name	Tag ID	Comment
Preferred Playback Sequencing	(0018,1244)	Always specified for a multi-frame image as 0.
Frame Time	(0018,1063)	Always specified for a multi-frame image.
Recommended Display Frame Rate	(0008,2144)	Always specified for a multi-frame image.
Cine Rate	(0018,0040)	Always specified for a multi-frame image.

Table 3-22: Significant Multi-Frame Module Attributes

Attribute Name	Tag ID	Comment
Number of Frames	(0028,0008)	Always specified for a multi-frame image.
Frame Increment Pointer	(0028,0009)	Always specified for a multi-frame image as 0018,1063.

Table 3-23: Significant US Region Calibration Module Attributes

Attribute Name	Tag ID	Comment
Sequence of Ultrasound Regions	(0018,6011)	Always specified. One sequence for each existing region.
Region Location Min x_0	(0018,6018)	Always specified.
Region Location Min y_0	(0018,601A)	Always specified.
Region Location Min x_1	(0018,601C)	Always specified.
Region Location Min y_1	(0018,601E)	Always specified.
Physical Units Y Direction	(0018,6024)	Always specified.
Physical Units X Direction	(0018,6026)	Always specified.
Physical Delta X	(0018,602C)	Always specified.
Physical Delta Y	(0018,602E)	Always specified.
Region Spatial Format	(0018,6012)	Always specified.
Region Data Type	(0018,6014)	Always specified.
Region Flags	(0018,6016)	Always specified.

Table 3-24: Significant US Image Module Attributes

Attribute Name	Tag ID	Comment
Samples per pixel	(0028,0002)	Always specified as 3 for RGB and 1 for MONOCHROME2
Photometric Interpretation	(0028,0004)	Always specified. The following photometric interpretations can be specified: MONOCHROME2 for mono, RGB for color, and YBR_FULL_422 for compressed JPEG.
Bits Allocated	(0028,0100)	Always specified as 8.
Bits Stored	(0028,0101)	Always specified as 8.
High bit	(0028,0102)	Always specified as 7.
Planar Configuration	(0028,0006)	Present if RGB. Always specified as Color-by-pixel (0).
Pixel Representation	(0028,0103)	Always specified as 0.
Frame Increment Pointer	(0028,0009)	Always specified for a multi-frame image as 0018,1063.
Image Type	(0008,0008)	Always specified as ORIGINAL/PRIMARY.
Lossy Image Compression	(0028,2110)	Set to 00 if the image is lossless compressed, set to 01 if the image is lossy compressed, and not set if no compression is used.

Table 3-25: Significant VOI LUT Module Attributes

Attribute Name	Tag ID	Comment
Window Center	(0028,1050)	Set to 127.5 if the image is monochrome otherwise it is not set.
Window Width	(0028,1051)	Set to 256 if the image is monochrome otherwise it is not set.
Window Center & Width Explanation	(0028,1055)	Set to *null* if the image is monochrome otherwise it is not set.

Table 3-26: Significant SOP Common Module Attributes

Attribute Name	Tag ID	Comment
SOP Class UID	(0008,0016)	Always specified.
SOP Instance UID	(0008,0018)	Always specified. Globally unique image ID generated by the system.
Instance Creation Date	(0008,0012)	Always specified.
Instance Creation Time	(0008,0013)	Always specified.
Instance Creator UID	(0008,0014)	Always specified. Globally unique system ID.

3.3 MODALITY WORKLIST AE - SPECIFICATION

The Modality Worklist AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 3-27: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	**Standard**

3.3.1 Association Establishment Policies

An association is initiated to retrieve a worklist. This Association is initiated when the user chooses to initiate a new worklist query through the user interface. The Association is closed after the worklist is retrieved.

3.3.1.1 General

The default PDU size is 16 384 bytes. The PDU size is fully configurable by the user.

3.3.1.2 Number of Associations

The Worklist Modality AE only supports one open association at a time. Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Storage AE.

3.3.1.3 Asynchronous Nature

The Modality Worklist AE does not perform any asynchronous operations.

3.3.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major.minor.build*

Where *major* equals the major version number of the SONIX Software, *minor* equals the minor version number of the SONIX Software, and *build* equals the build number of the SONIX Software.

3.3.2 Association Initiation by: Real-World Activity

The Modality Worklist AE initiates an association to Modality Worklist Server when the user issues a search using the Patient Management Dialog.

3.3.2.1 Association Initiation by: Worklist Search

From within the Patient Management Dialog the user can specify worklist search parameters. The user then performs a search that initiates an association upon which a query built with these parameters is issued to the Modality Worklist Server. After receiving a worklist the association is closed.

3.3.3 Proposed Presentation Context to a Modality Worklist Server

The following list applies when SONIX is configured to print to a Grayscale Print Server:

Table 3-28: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	UID	Name	UID	Role	Extended Negotiation
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.3.3.1 SOP Specific Conformance to Modality Worklist Service SOP Classes

The Modality Worklist AE makes use of the following attributes retrieved from a Modality Worklist Server. Also given below are the attributes that are mapped to an Ultrasound Image IOD.

Table 3-29: Significant Scheduled Procedure Step Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
>Scheduled Procedure Step Start Date	(0040,0002)	No	
>Modality	(0040,0060)	No	
>Scheduled Performing Physician's Name	(0040,0006)	Yes	Mapped to Performing Physicians' Name (0008,1050).
>Scheduled Procedure Step Description	(0040,0007)	Yes	Mapped to Series Description (0008,103E) and to Study Description (0008,1030).

Table 3-30: Significant Requested Procedure Step Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Study Instance UID	(0020,000D)	Yes	
Name of Intended Recipients of Results	(0040,1010)	Yes	Mapped to Physician(s) of Record (0008,1048).

Table 3-31: Significant Imaging Service Request Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Accession Number	(0008,0050)	Yes	
Referring Physician's Name	(0008,0090)	Yes	

Table 3-32: Significant Visit Admission Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Admitting Diagnosis Description	(0008,1080)	Yes	

Table 3-33: Significant Patient Identification Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Patient Name	(0010,0010)	Yes	
Patient ID	(0010,0020)	Yes	
Other Patient IDs	(0010,1000)	Yes	

Table 3-34: Significant Patient Demographic Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Patient Birth Date	(0010,0030)	Yes	
Patient Sex	(0010,0040)	Yes	
Patient Weight	(0010,1030)	Yes	
Patient Size	(0010,1020)	Yes	
Ethnic Group	(0010,2160)	Yes	
Patient Comments	(0010,4000)	Yes	

Table 3-35: Significant Patient Medical Module Attributes

Attribute Name	Tag ID	Mapped to Ultrasound Image IOD	Comment
Pregnancy Status	(0010,21C0)	No	
Additional Patient History	(0010,21B0)	Yes	
Last Menstrual Date	(0010,21D0)	No	

The attributes that the Modality Worklist AE specifies in a worklist query are as follows.

Table 3-36: Worklist Query Attributes

Attribute Name	Tag ID	Comment
>Scheduled Procedure Step Start Date	(0040,0002)	Single value matching or wildcard matching
>Modality	(0040,0060)	Single value matching or wildcard matching
Accession Number	(0008,0050)	Single value matching or wildcard matching
Patient Name	(0010,0010)	Single value matching or wildcard matching
Patient ID	(0010,0020)	Single value matching or wildcard matching

3.4   STORAGE COMMITMENT AE - SPECIFICATION

The Storage Commitment AE provides conformance to the following DICOM SOP Classes as an SCU:

Table 3-37: SOP Class Conformance as SCU

SOP Class Name	SOP Class UID	Conformance Level
Storage Commitment Push Model	1.2.840.10008.1.20.1	Standard

3.4.1   Association Establishment Policies

The Storage Commitment AE, in the following circumstances, initiates an association:

- When the system is started and the Storage Commitment AE has been activated
- After receiving a successful C-STORE response for a previously stored image
- The Storage Commitment Server responds with an N-Event Report to convey the status of a previous storage commitment

3.4.1.1   General

The default PDU size is 16 384 bytes. The PDU size is fully configurable by the user.

3.4.1.2   Number of Associations

Up to two separate associations may be active at one time. One association may be used to generate an N-Action while another is used to listen for an N-Event Report.

Associations belonging to other active Application Entities may be open simultaneously with the association belonging to the Image Storage AE.

3.4.1.3   Asynchronous Nature

The Storage Commitment AE may listen for N-Event Reports on a different association than the one being used to generate an N-Action.

3.4.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.124.113577.1

Implementation Version name: *major*.*minor*.*build*

Where *major* equals the major version number of the SONIX Software, *minor* equals the minor version number of the SONIX Software, and *build* equals the build number of the SONIX Software.

3.4.2 Association Initiation by: Real-World Activity

The Storage Commitment AE initiates an association to Storage Commitment Server when the user acquires an ultrasound image that is stored to a Storage Server. . An association is also initiated when the Storage Commitment Server sends an N-Event Report, using role-reversal negotiation.

3.4.2.1 Association Initiation by: Image Acquisition

After the user acquires an image and it has successfully been stored to a Storage Server then an association is initiated with a Storage Commitment Server. A storage commitment request (N-Action Request) is issued and then the association is closed.

3.4.2.2 Association Initiation by: Role-Reversal Negotiation

After the Storage Commitment AE has issued an N-Action Request the Storage Commitment Server may, at any time, respond with an N-Event Report using role-reversal negotiation. Upon reception of an N-Event Report an association is opened to receive the commitment status report.

3.4.3 Proposed Presentation Context to a Storage Commitment Server

Table 3-38: Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax			
Name	UID	Name	UID	Role	Extended Negotiation
Storage Commitment Push Model	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

3.4.3.1 SOP Specific Conformance to Storage Commitment SOP Classes

The Storage Commitment AE makes use of the following attributes when issuing an N-Action Request to a Storage Commitment Server.

Table 3-39: Significant Request Storage Commitment Module Attributes

Attribute Name	Tag ID	Requirement Type SCU/SCP
Transaction UID	(0008,1195)	1/1
Referenced SOP Sequence	(0008,1199)	1/1
>Referenced SOP Class UID	(0008,1150)	1/1
>Referenced SOP Instance UID	(0008,1155)	1/1

The Storage Commitment AE makes use of the following attributes from a received N-Event Report from a Storage Commitment Server.

Table 3-40: Significant Storage Commitment Request Successful Module Attributes

Attribute Name	Tag ID	Requirement Type SCU/SCP
Transaction UID	(0008,1195)	-/1
Referenced SOP Sequence	(0008,1199)	-/1
>Referenced SOP Class UID	(0008,1150)	-/1
>Referenced SOP Instance UID	(0008,1155)	-/1

Table 3-41: Significant Storage Commitment Request Failed Module Attributes

Attribute Name	Tag ID	Requirement Type SCU/SCP
Transaction UID	(0008,1195)	-/1
Failed SOP Sequence	(0008,1198)	-/1
>Referenced SOP Class UID	(0008,1150)	-/1
>Referenced SOP Instance UID	(0008,1155)	-/1
>Failure Reason	(0008,1197)	-/1

CHAPTER 4: COMMUNICATION PROFILES

4.1 SUPPORTED COMMUNICATION STACKS

The SONIX AE provides DICOM 3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.2 TCP/IP

The SONIX AE inherits its TCP/IP stack from the Windows XP system upon which it executes.

4.2.1 Physical Media Support

The SONIX AE is indifferent to the physical medium over which TCP/IP executes as it inherits this support from the Windows XP system upon which it executes.

CHAPTER 5: EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

5.1 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOPS

Not applicable.

5.2 PRIVATE TRANSFER SYNTAXES

Not applicable.

CHAPTER 6: CONFIGURATION

6.1 AE TITLE/PRESENTATION ADDRESS MAPPING

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Ultrasonix Installation Personnel.

6.2 CONFIGURABLE PARAMETERS

Several parameters pertaining to the DICOM component of the SONIX are configurable.

6.2.1 Network Configuration

The configurable network parameters are:

- Hostname
- IP Address
- Subnet Mask
- Gateway

6.2.2 Image Printing Configuration

The configurable local (SCU) network parameters for the DICOM Image Printing Module are:

- Application Entity Title
- Network Speed
- Association Timeout
- Packet Data Unit (PDU) Size

The configurable remote (SCP) network parameters for the DICOM Image Printing Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

The configurable settings for the DICOM Image Printing Module are:

- Print in Color: Yes (Color Printing)/No (Grayscale Printing) - depends on printer
- Reversed Brightness: Yes/No
- Columns: number of columns per page
- Rows: number of rows per page
- Number of Copies: number of copies to be printed
- Medium Type: PAPER, CLEAR FILM, BLUE FILM
- Print Priority: HIGH, MED, LOW
- Film Destination: PROCESSOR, MAGAZINE
- Orientation: PORTRAIT, LANDSCAPE
- Size: 8x10 Inches, 10x12 Inches, 10x14 Inches, 11x14 Inches, 14x14 Inches, 14x17 Inches, 24x30 cm, 24x24 cm
- Magnification: REPLICATE, BILENEAR, CUBIC, NONE
- Smoothing: printer specific
- Trim: YES/NO
- Border Density: WHITE, BLACK, image density in hundredths of OD

- Empty Density: WHITE, BLACK, image density in hundredths of OD
- Minimum Density: image density
- Maximum Density: image density
- Configuration Information: printer specific
- Polarity: NORMAL, REVERSE
- Image Size (mm): printer specific

6.2.3   Image Storage Configuration

The configurable local (SCU) network parameters for the DICOM Image Storage Module are:

- Application Entity Title
- Network Speed
- Association Timeout
- Packet Data Unit (PDU) Size

The configurable remote (SCP) network parameters for the DICOM Storage Printing Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

The configurable settings for the DICOM Image Storage Module are:

- Lossy Compression Ratio: 1% - 100%
- Color/Grayscale: Send Color or Grayscale images to the Storage Server

6.2.4   Modality Worklist Configuration

The configurable local (SCU) network parameters for the DICOM Modality Worklist Module are:

- Application Entity Title
- Network Speed
- Association Timeout
- Packet Data Unit (PDU) Size

The configurable remote (SCP) network parameters for the DICOM Modality Worklist Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

6.2.5 Storage Commitment Configuration

The configurable local (SCU) network parameters for the DICOM Storage Commitment Module are:

- Application Entity Title (Storage Commitment N-Action Request Issuer)
- Port Number (Storage Commitment N-Action Request Issuer)
- Network Speed
- Association Timeout
- Packet Data Unit (PDU) Size
- Application Entity Title (Storage Commitment N-Event Report Listener)
- Port Number (Storage Commitment N-Event Report Listener)

The configurable remote (SCP) network parameters for the DICOM Storage Commitment Module are:

- Application Entity Title
- Hostname/IP Address
- Port Number

6.2.6 Miscellaneous Configuration Parameters

The following parameters can also be dynamically specified from within the system:

- Institution Name [mapped to Institution Name (0008,0080)]

CHAPTER 7: SUPPORT FOR EXTENDED CHARACTER SETS

ISO_IR 100 (Latin No. 1) is always used.

No support for other Extended Character Sets is provided.