

***DICOM
Conformance
Specifications for
the HDI® 5000
Ultrasound System
NetLink Capability***



A Philips Company



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0. Introduction

This document describes the ATL HDI 5000 Ultrasound System's conformance to the ACR-NEMA DICOM (Digital Imaging and Communications in Medicine) standard and satisfies the DICOM requirement for a vendor conformance specification.

The HDI 5000 system is an ultrasound imaging device. The NetLink option of the HDI 5000 system provides a means to send images to DICOM storage servers and printers.

0.1 DICOM Background

The DICOM information exchange specification provides a definitive structure of commands and information that allow for the inter-communication of medical imaging devices. Developed by the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA), the DICOM standard strives to promote communication of image information through the use of a standardized set of command classes and information semantics.

The DICOM standard defines classes of information that are common to many modalities of medical imaging. However, to meet the specific needs of information content for such a diverse range of information, the DICOM specification defines structures for a multitude of medical data. To alleviate the need for applications to implement every aspect of the DICOM specification, a list of conformance tables for every modality was created to define the minimum set of information necessary for data exchanges. A requirement of the DICOM specification is to maintain a compliance document that outlines a subset of DICOM services and data classes that are supported by an application. The purpose of this document is to define a subset of DICOM for the exchange of information with the ATL HDI 5000 system via its NetLink feature.

This document is written with respect to the ACR-NEMA Digital Imaging and Communications in Medicine (DICOM) version number 3.0. For complete definitions of terms and acronyms in this document, please refer to the Digital Imaging and Communications in Medicine (DICOM) Standard.

1. Implementation Model

The HDI 5000 NetLink feature incorporates the DICOM 3.0 standard for networked image printing and image store functions. Images are transferred from the HDI 5000 ultrasound system using standard network connections to be processed on a centralized printer or stored on a DICOM-compatible file server.

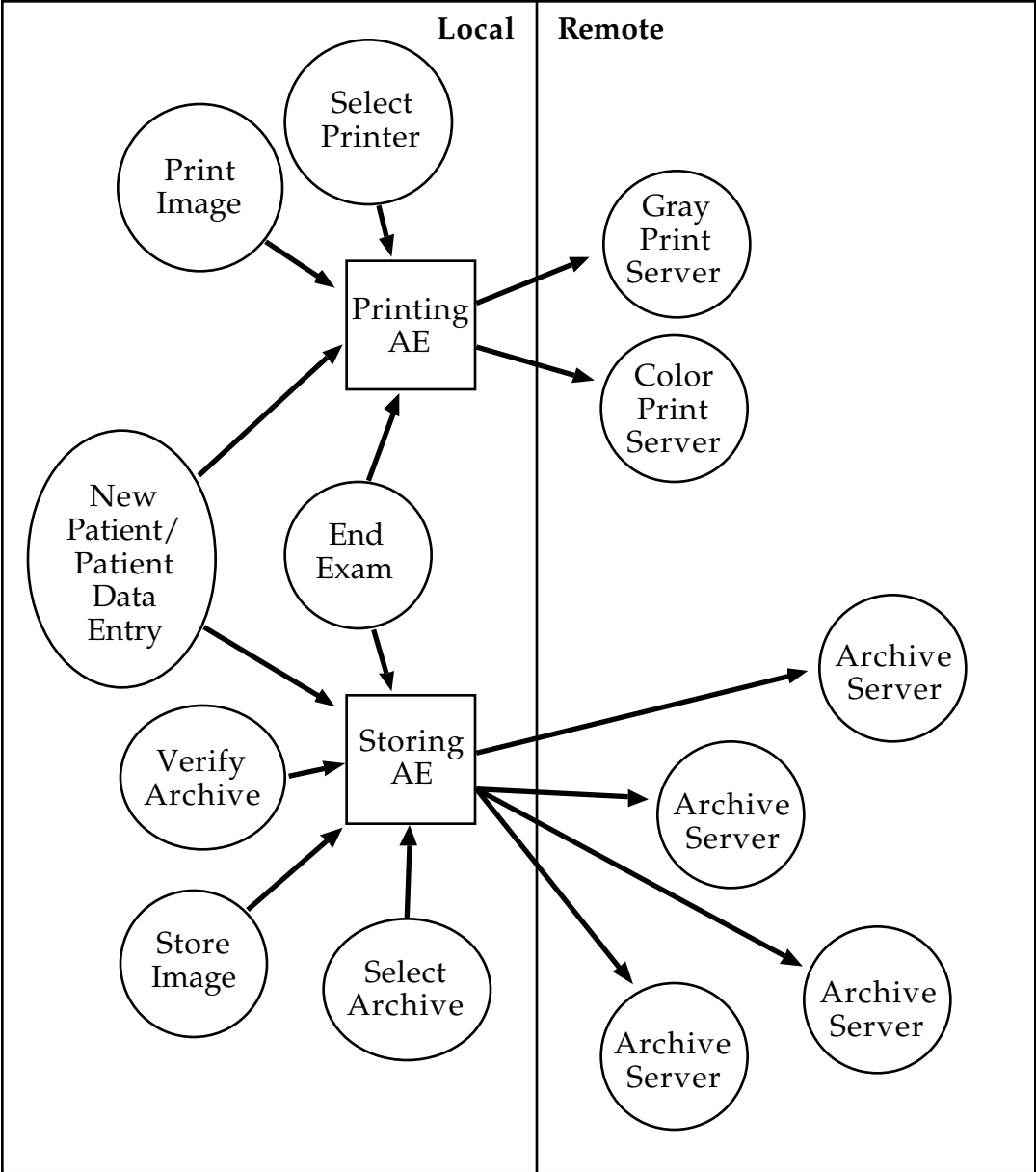
1.1 Application Data Flow Diagram

Figure 1.1-1 represents the NetLink device's Application Entities (AE) (in the boxes) and depicts the relationship of the Application Entity's use of DICOM to invoke real-world activities (shown on the right side).

When the user selects a New Patient via the Patient Data Entry facility, the Printing AE will initiate separate associations to the print servers to verify their online status. These associations remain open during the examination. When Print is commanded (and depending upon the system configuration), the Printing AE will send an image to the appropriate printer. The N_Get Printer SOP is used to ensure that the print servers remain online during this time. When the End Exam command is invoked, any partially filled sheet of film will be forced to be printed and then the associations are closed.

Also, when the user selects a New Patient via the Patient Data Entry facility, the Storing AE will initiate a separate association to each selected storage server to verify its online status. The associations remain open during the exam. When the user selects Store Image, the Storing AE sends the image to the server. When the End Exam command is invoked the association is closed.

Figure 1.1-1 Implementation Model



The Print and Store AEs share the same AE title

1.2 Functional Definitions of AEs

Printing AE

This AE handles all aspects of the Print Management SCU. The remote SCP must support the Verification SOP class.

Storing AE

This AE handles sending ultrasound images to a storage server using the DICOM Store SCU Services. The remote SCP must support the Verification SOP class.

1.3 Sequencing of Real-world Activities

For printing and storing using the Print Gray Image, Print Color Image, and Store Image commands, an association must have been previously opened using the New Patient command. An association is also initiated in certain circumstances upon system power up or connection to the network.

2. AE Specifications

2.1 Printing AE - Specification

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

SOP Class Name	SOP Class UID	Conformance Level
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Standard
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Standard
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Standard
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Standard
Basic Gray Image Box SOP Class	1.2.840.10008.5.1.1.4	Standard
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Standard
Printer SOP Class	1.2.840.10008.5.1.1.16	Standard
Verification SOP Class	1.2.840.10008.1.1	Standard

2.1.1 Association Establishment Policies

The Printing AE will initiate an association when the user invokes the New Patient / Patient Data Entry command. The Gray and Color SOP Print Management Service Class connections will be done on separate associations. The N_Get Printer SOP will be used to verify that an association is still active even though no printing is taking place.

2.1.1.1 General

Maximum PDU size offered: 32,768 bytes

Minimum PDU size accepted: 1,024 bytes

2.1.1.2 Number of Associations

Number of simultaneous associations for the Printing AE:

- 1 for Gray Print Management
- 1 for Color Print Management

Note that the other Application Entities in this device may be simultaneously active and thus other associations may be open simultaneously with these.

2.1.1.3 Asynchronous Nature

The Printing AE will not use asynchronous operations.

2.1.1.4 Implementation Identifying Information

Implementation Class UID: "1.2.840.113663.1"

Implementation Version name: "Tiller_v101"

Notes: "113663" is registered by ATL with ANSI. Version name above will be used initially but is subject to change with versions.

2.1.2 Association Initiation by Real-world Activity

The Printing AE will open associations to the Gray Print Server and to the Color Print Server when the real-world activity occurs corresponding to the user invocation of New Patient or Select Printer.

2.1.2.1 Association Initiation by New Patient

The user invocation of New Patient will cause separate associations to be initiated to a Gray Print Server and a Color Print Server. These two associations may actually be handled by one device but are managed separately by the Printing AE.

2.1.2.2 Association Initiation by Select Printer

The user invocation of Select Printer will initiate an association to the Print Server followed by an N-GET for printer status.

2.1.3 Proposed Presentation Context to a Gray Print Server

Table 2.1.3 -1 Printing AE Proposed Presentation Contexts to a Gray Print Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Gray Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

2.1.3.1 SOP Specific Conformance to Verification SOP Class

The Printing AE requires the Verification SOP Class as an SCU. The remote SCP must support the Verification SOP Class.

2.1.3.2 SOP Specific Conformance to Basic Gray Print Management Meta SOP Class

The Printing AE provides Standard Conformance to the Basic Gray Print Management Meta SOP Class as an SCU. This implies standard conformance for the:

- Basic Film Session SOP Class,
- Basic Film Box SOP Class,
- Basic Grayscale Image Box SOP Class,
- Printer SOP Class.

Each of these SOP classes is described in the paragraphs to follow.

2.1.3.3 SOP Specific Conformance to Basic Film Session SOP Class

DICOM specified usage: M = mandatory, U = User option

Supported DIMSE Services

Name	Usage	Description
N-Create	M	Creates the film session
N-Set	U	Not used
N-Delete	U	Deletes the film session
N-Action	U	Not used

Supported SOP Class Elements

Name	Usage	Range	Description
Number of Copies	U	1 to many	Number of requested copies of film
Print Priority	U	MED	Used
Medium Type	U	Paper Clear Film Blue Film	Range may be further restricted by printer
Film Destination	U	Magazine Processor	Range may be further restricted by printer
Film Session Label	U	--	Not used
Memory Allocation	U	--	Not used

2.1.3.4 SOP Specific Conformance to Basic Film Box SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Create	M	Creates the film box
N-Set	U	Not used
N-Delete	U	Deletes the film box – used after each film is printed
N-Action	M	PRINT – sent after each filling of a film box and also at the end of the exam if one or more images have been transferred into the film box

Supported SOP Class Elements

Name	Usage	Range	Description
Image Display Format	M	Standard \ 1,1 Standard \ 1,1 Standard \ 1,2 Standard \ 2,1 Standard \ 2,3 Standard \ 3,2 Standard \ 3,3 Standard \ 3,3 Standard \ 3,4 Standard \ 4,3 Standard \ 3,5 Standard \ 5,3 Standard \ 4,5 Standard \ 5,4 Standard \ 5,6 Standard \ 6,5	Range may be further restricted by printer
Referenced Film Session Sequence	M		Used
Referenced SOP Class UID	M	1.2.840.10008.5.1.1.1	Film Session SOP Class UID
Referenced SOP Instance UID	M		Referenced Film Session SOP
Film Orientation	U	Portrait Landscape	Range may be further restricted by printer
Film Size ID	U	8 in X 10 in 14 in X 14 in 10 in X 12 in 14 in X 17 in 10 in X 14 in 24 cm X 24 cm 11 in X 14 in 24 cm X 30 cm 11 in X 17 in 35 cm X 43 cm 12 in X 18 in	Range may be further restricted by printer
Magnification Type	U	Configurable	None, Bilinear, Cubic, Bicubic, Mitchell, Lanczos, Replicate
Max Density	U	Limited by printer	Used
Configuration Information	U	Limited by printer	Used
Annotation Display Format ID	U		Not used
Smoothing Type	U		Not used
Border Density	U	Dmin to Dmax	Used
Empty Image Density	U	Dmin to Dmax	Used
Min Density	U	Limited by printer	Used
Trim	U		Not used

2.1.3.5 SOP Specific Conformance to Basic Grayscale Image Box SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Set	M	An image box instance is created by the SCP for each potential image of the film box. Only the instances that actually contain images will be updated with the N-SET message.

Supported SOP Class Elements

Name	Usage	Range	Description
Image Position	M	1-n	Used
Pre-formatted Grayscale Image Sequence	M		Used
Samples/pixel	M	1	Used
Photometric Interpretation	M	MONOCHROME2	0 = black, 255 = white
Rows	M	476 (NTSC), 576 (PAL)	Pixels
Columns	M	640 (NTSC), 768 (PAL)	Pixels
Pixel Aspect Ratio	M	68/68 (NTSC);82/82 (PAL)	
Bits Allocated	M	8	8 bits per sample
Bits Stored	M	8	Used
High bit	M	7	Bit 7 is MSB
Pixel Representation	M	0	Unsigned pixel values
Pixel Data	M		gray pixel data
Polarity	U		Not used
Referenced Overlay Sequence	U		Not used
>SOP Class UID	U		Not used
>SOP Instance UID	U		Not used
Magnification Type	U	Configurable	Used
Smoothing Type	U		Not used
Requested Image Size	U		Not used

2.1.3.6 SOP Specific Conformance to Printer SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Event-Report	M	Handled but always ignored. Asynchronous input from the printer to this AE used to report changes in printer status. It may be received any time after association establishment and before association release or abort.
N-Get	U	May be issued by this device at any time to get printer status. The Attribute Identifier List will always be empty indicating that all attributes are to be returned.

Supported SOP Class Elements

Note: These attributes are not set by this device. The attribute description here indicates which attributes are used by this device when they are returned by the printer.

Name	Usage	Range	Description
Printer Status	U	NORMAL WARNING FAILURE	Warning and Failure are reported to user
Print Status Info	U		Reported to user
Printer Name	U		Ignored
Manufacturer	U		Ignored
Model Name	U		Not used
Serial Number	U		Not used
Software Version	U		Not used
Calibration Date	U		Not used
Calibration Time	U		Not used

2.1.4 Proposed Presentation Context to a Color Print Server

Table 2.1.2.1.2-1 Printing AE Proposed Presentation Contexts to a Color Print Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

2.1.4.1 SOP Specific Conformance to Verification SOP Class

The Printing AE requires the Verification SOP Class as an SCU. The remote SCP must support the Verification SOP Class.

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

The Printing AE provides Standard Conformance to the Basic Color Print Management Meta SOP Class as an SCU. This implies standard conformance for the following SOP classes:

- Basic Film Session SOP Class
- Basic Film Box SOP Class
- Basic Color Image Box SOP Class
- Printer SOP Class

Only the SOP classes specific to Color are described in the sections that follow. Otherwise, the Color Print Management Meta SOP Class uses the same general Printer and Film SOP classes as Grayscale.

2.1.4.3 SOP Specific Conformance to Basic Color Image Box SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Set	M	An image box instance is created by the SCP for each potential image of the film box. Only the instances that will actually contain images will be updated with the N-SET message.

Supported SOP Class Elements

Name	Usage	Range	Description
Image Position	M	1-n	Used
Pre-formatted Color Image Sequence	M		Used
Samples/pixel	M	3	Used
Photometric Interpretation	M	RGB	Used
Planar Configuration	M	1	Planar – red plane first, then green and blue
Rows	M	476 (NTSC), 576 (PAL)	Pixels
Columns	M	640 (NTSC), 768 (PAL)	Pixels
Pixel Aspect Ratio	M	68/68 (NTSC), 82/82 (PAL)	
Bits Allocated	M	8	8 bits per sample
Bits Stored	M	8	Used
High bit	M	7	Bit 7 is MSB
Pixel Representation	M	0	Unsigned pixel values
Pixel Data	M		Color pixel planes data
Polarity	U		Not used
Referenced Overlay Sequence	U		Not used
>SOP Class UID	U		Not used
>SOP Instance UID	U		Not used
Magnification Type	U	Configurable	Used
Smoothing Type	U		Not used
Requested Image Size	U		Not used

2.2 Storing AE - Specification

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

SOP Class Name	SOP Class UID	Conformance Level
Verification SOP Class	1.2.840.10008.1.1	Standard
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	Standard
Ultrasound Image Storage SOP Class (retired)	1.2.840.10008.5.1.4.1.1.6	Standard
Ultrasound Multiframe Image SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Standard
Ultrasound Multiframe Image SOP Class (retired)	1.2.840.10008.5.1.4.1.1.3	Standard

Note: the choice of retired or new SOP Class is configurable.

2.2.1 Association Establishment Policies

When the system is configured to “store during exam” the Storing AE will initiate an association when the user invokes the New Patient command. When configured to “store at end of exam,” the system will open the association at the end of the exam, transfer the entire study, then close the association. If an error occurs and the connection is broken, the system will periodically reattempt association to transfer the remaining data, even after the occurrence of a power cycle.

2.2.1.1 General

Maximum PDU size offered: 32,768 bytes

Minimum PDU size accepted: 1,024 bytes

2.2.1.2 Number of Associations

Number of simultaneous associations: 4

Note that the other Application Entities in this device may also be simultaneously active.

2.2.1.3 Asynchronous Nature

The Storing AE will not use asynchronous operations.

2.2.1.4 Implementation Identifying Information

Implementation Class UID: "1.2.840.113663.1"

Implementation Version name: "Tiller_v101"

Notes: "113663" is registered by ATL with ANSI. Version name above will be used initially but is subject to change with versions.

2.2.2 Association Initiation by Real-world Activity

The Storing AE will open an association to the Storage Server when the real-world activity occurs corresponding to the user invocation of New Patient or Select Storage Server.

2.2.2.1 Association Initiation by New Patient

The user invocation of New Patient will cause an association to be initiated to a Storage Server.

2.2.2.2 Association Initiation by Select Storage Server

The user invocation of Storage Server will cause an association to be initiated to a Storage Server.

2.2.3 Proposed Presentation Context to a Storage Server

The presentation context is configurable from the SOPs in the following table.

Table 2.2.3-1 Storing AE Proposed Presentation Contexts to a Storage Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Ultrasound Multiframe Image	1.2.840.10008.5.1.4.1.1.3.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
Ultrasound Multiframe Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

2.2.3.1 SOP Specific Conformance to Verification SOP Class

The Storing AE provides standard conformance to the Verification SOP Class as an SCU. The remote SCP must support the Verification SOP Class on the same Association as the Storage SOP Class.

2.2.3.2 SOP Specific Conformance to Ultrasound Image Storage SOP Class

The Ultrasound Image Storage SOP uses the Ultrasound Image IOD Modules as follows:

Ultrasound Image Storage Modules Used

Module	Usage	Description
Patient	M	Used
General Study	M	Used
Patient Study	U	Used
General Series	M	Used
Frame of Reference	U	Not used
US Frame of Reference	C	Not used
General Equipment	M	Used
General Image	M	Used
Image Pixel	M	Used
Contrast/bolus	C	Not used
Cine	C	Used (in Multiframe SOP)
Multiframe	C	Used (in Multiframe SOP)
US Region Calibration	U	Used, if configured
US Image	M	Used
Overlay Plane	U	Not used
VOI LUT	U	Used, if configured
SOP Common	M	Used
Curve Identification	M	Not used
Curve	M	Not used
Audio	U	Not used
Curve SOP Common	M	Not used

Each module that is used by the Storing AE has a table below that indicates the elements supported.

Patient Module Elements

Name	Type	Tag	VR	Range	Description
Patient's Name	2	0010, 0010	PN	xx	Patient name with ^ delimiters
Patient ID	2	0010, 0020	LO	xx	64 characters maximum
Birth Date	2	0010, 0030	DA	xx	Used
Patient Sex	2	0010, 0040	CS	xx	Zero length
Referenced Patient Sequence	3				Not used
Patient's Birth Time	3				Not used
Other Patient ID	3				Not used
Other Patient Names	3				Not used
Ethnic Group	3				Not used
Patient Comments	3				Not used

General Study Module Elements

Name	Type	Tag	VR	Range	Description
Study Instance UID	1	0020, 000D	UI	xx	Used
Study Date	2	0008, 0020	DA	yyyymmdd	Exam date
Study Time	2	0008, 0030	TM	hhmmss	Exam time
Referring Physician Name	2	0008, 0090	PN		Zero length
Study ID	2	0020, 0010	SH	xx	System generated exam number
Accession Number	2	0008, 0050	SH	xx	Used
Study Description	3	0008, 1030	LO	xx	Zero length
Name of Reading Physician(s)	3				Not used
Referenced Study Sequence	3				Not used

General Series Module Elements

Name	Type	Tag	VR	Range	Description
Modality	1	0008, 0060	CS	US	Always US for ultrasound
Series Instance UID	1	0020, 000E	UI	xx	Used
Series Number	2	0020, 0011	IS	xx	Series number in exam
Laterality	2C	0020, 0060			Not used
Series Date	3	0008, 0021	DA	yyyymmdd	Zero length if unknown
Series Time	3	0008, 0031	TM	hhmmss	Zero length if unknown
Performing Physician's Name	3	0008, 1050			Not used
Protocol Name	3	0018, 1030	LO	xx	Zero length
Series Description	3	0008, 103E	LO	xx	Used
Operator's Name	3	0008, 1070			Not used
Referenced Study Component Sequence	3	0008, 1111			Not used
Body Part Examined	3	0018, 0015			Not used
Patient Position	2C	0018, 5100			Not used
Smallest Pixel Value in Series	3	0028, 0108			Not used
Largest Pixel Value in Series	3	0028, 0109			Not used

General Equipment Module Elements

Name	Type	Tag	VR	Range	Description
Manufacturer	2	0008, 0070	LO	ATL	Used
Institution Name	3	0008, 0080	LO		Used
Institution Address	3				Not used
Station Name	3				Not used
Institutional Department Name	3				Not used
Manufacturer's Model Name	3	0008, 1090	LO	HDI 5000	Used
Device Serial Number	3				Not used
Software Version	3	0018, 1020	LO	xx	Used
Spatial Resolution	3				Not used
Date of Last Calibration	3				Not used
Time of Last Calibration	3				Not used
Pixel Padding Value	3				Not used

General Image Module Elements

Name	Type	Tag	VR	Range	Description
Image Number	2	0020, 0013	IS	1-200	Image number in exam
Patient Orientation	2C	0020, 0020	CS		Zero length
Image Date	2C	0008, 0023	DA	yyyymmdd	Used
Image Time	2C	0008, 0033	TM	hhmmss	Used
Image Type	2	0008, 0008	CS		Used, see Image Attribute Descriptions
Acquisition Number	3				Not used
Acquisition Date	3				Not used
Acquisition Time	3				Not used
Referenced Image Sequence	3				Not used
Derivation Description	3				Not used
Source Image Sequence	3				Not used
Images in Acquisition	3				Not used
Image Comments	3	0020,4000	LT	xx	User annotation text or modality description (20 character maximum)

Image Pixel Module Elements

Name	Type	Tag	VR	Range	Description
Samples/ Pixel	1	0028, 0002	US	1, 3	For Gray For Color
Photometric Interpretation	1	0028, 0004	CS	MONOCHROME2, RGB	For Gray For Color
Rows	1	0028, 0010	US	476 (NTSC), 576 (PAL)	Used
Columns	1	0028, 0011	US	640 (NTSC), 768 (PAL)	Used
Bits Allocated	1	0028, 0100	US	8	Used
Bits Stored	1	0028, 0101	US	8	Used
High Bit	1	0028, 0102	US	7	Used
Pixel Representation	1	0028, 0103	US	0	Unsigned ints
Pixel Data	1	7FE0, 0010	OB		Used
Planar Configuration	1C	0028, 0006	US	0, 1	0=Pixel Interleave, 1=Planar
Aspect Ratio	1C	0028, 0034	IS	68/68 (NTSC); 82/82 (PAL)	Pixel aspect ratio
Smallest Image Pixel Value	3	0028, 0106			Not used
Largest Image Pixel Value	3	0028, 0107			Not used
Red Palette Color Lookup Table Descriptor	1C	0028, 1101	US		Not used
Green Palette Color Lookup Table Descriptor	1C	0028, 1102	US		Not used
Blue Palette Color Lookup Table Descriptor	1C	0028, 1103	US		Not used
Red Palette Color Lookup Table Data	1C	0028, 1201	US		Not used
Green Palette Color Lookup Table Data	1C	0028, 1202	US		Not used
Blue Palette Color Lookup Table Data	1C	0028, 1203	US		Not used

US Image Module Elements

Name	Type	Tag	VR	Range	Description
Photometric Interpretation	1	0028, 0004	CS	MONOCHROME2 RGB	For Gray For Color
Pixel Representation	1	0028, 0103	US	0	Unsigned ints
Frame Increment Pointer	1C	0028, 0009	AT		Sequencing by frame time vector
Lossy Image Compression	1C	0028, 2110	CS		Used
Image Type	2	0008, 0008	CS		Used, see Image Attribute Descriptions
Number Stages	2C	0008, 2124	IS	0	Present, always zero
Number Views in Stage	2C	0008, 212A	IS	0	Present, always zero
Referenced Overlay Sequence	3				Not used
Referenced Curve Sequence	3				Not used
Stage Name	3	0008, 2120	SH		Zero length
Stage Number	3	0008, 2122	IS	0	Present, always zero
View Number	3	0008, 2128	IS	0	Present, always zero
Number of Event Timers	3	0008, 2129	IS	0	Present, always zero
Event Elapsed Times	3	0008, 2130	DS		Zero length
Event Timer Name	3				Not used
Transducer Position	3				Not used
Transducer Orientation	3				Not used
Anatomic Structure	3				Not used
Trigger Time	3	0018, 1060	DS	0000	Present, always zero
Nominal Interval	3				Not used
Beat Rejection Flag	3				Not used
Low R-R Value	3				Not used
High R-R Value	3				Not used
Heart Rate	3	0018, 1088	IS	0	Present, always zero
Output Power	3				Not used
Transducer Data	3				Not used
Transducer Type	3				Not used
Focus Depth	3				Not used
Preprocessing Function	3				Not used
Mechanical Index	3				Not used
Bone Thermal Index	3				Not used
Cranial Thermal Index	3				Not used
Soft Tissue Thermal Index	3				Not used
Soft Tissue-focus Thermal Index	3				Not used
Soft Tissue-surface Thermal Index	3				Not used
Depth of Scan Field	3				Not used
Image Transformation Matrix	3				Not used
Image Translation Vector	3				Not used
Ultrasound color data present	3	0028, 0014	US	0 1	For Gray For Color

Image Attribute Descriptions

Image Type: This multivalued attribute is ORIGINAL/PRIMARY//nnnn. This denotes original source data based on primary examination. nnnn is a bit map designating the image modes:

0001 = 2D Imaging	0002 = M-Mode	0004 = CW Doppler
0008 = PW Doppler	0010 = Color Doppler	0020 = Color M-mode

Cine Module Elements

Name	Type	Tag	VR	Range	Description
Frame Time Vector	1	0018, 1065	IS	xx	An array of time intervals (in msec) between frames

Multiframe Module Elements

Name	Type	Tag	VR	Range	Description
Number of Frames	1C	0028, 0008	IS	2 - n	Number of frames in the loop
Frame Increment Pointer	1C	0028, 0009	AT	0018, 1065	Tag that specifies the frame increment

VOI LUT Element

Name	Type	Tag	VR	Range	Description
Window Center	3	0028, 1050	DS	128	Description of center point of range
Window Width	1C	0028, 1051	DS	256	Range assigned to 8 bit images (Required if Window Center is sent)

SOP Common Module Elements

Name	Type	Tag	VR	Range	Description
SOP Class UID Image Storage	1	0008, 0016	UI	Same as in Command Set	Same as in Command Set
SOP Instance UID	1	0008, 0018	UI	Same as in Command Set	Same as in Command Set
Specific Character Set	1C				Not used
Instance Creation Date	3				Not used
Instance Creation Time	3				Not used
Instance Creator ID	3				Not used

2.2.4 Storing AE Behavior to SCP Status

Storing AE Behavior to Status Returned from SCP

Status Value	Meaning	Description	Storing AE Behavior
0000	Success		Upon successfully storing data to an archive server, the Storing AE will continue operation without user notification
A7xx	Refused	Out of resources	The association is terminated and the user is notified of the failure
A9xx	Error	Data set does not match SOP class	Same as A7xx
Cxxx	Error	Cannot understand	Same as A7xx
B000	Warning	Coercion of data elements	Ignored
B007	Warning	Data set does not match SOP class	Same as A7xx
B006	Warning	Elements discarded	Ignored

3. Communication Profiles

3.1 TCP/IP Stack Supported

The TCP/IP protocol is used.

3.2 Physical Media Supported

Standard IEEE 802 (Ethernet) 10BaseT (twisted pair), 10Base2 (thin coax) and 10BaseFL (Fiber Optic Link) are supported. Destination Ethernet address shall be acquired using the Address Resolution Protocol (ARP). Internet Protocol (IP) address shall be acquired manually and pre-loaded into the device.

4. Extensions/Specializations/Privatizations

4.1 Standard Extended/Specialized/Private SOPs

None

4.2 Private Transfer Syntaxes

None

5. Configuration

This device obtains configuration information at the time of installation to provide the following:

- Mapping from Application Entity Title to Presentation Address
- Device configuration information

5.1 AE Title/Presentation Address Mapping

The translation from AE Title to Presentation Address is to be performed using a lookup table loaded at installation or some other time.

5.2 Configurable Parameters

A lookup table contains the following configuration parameters:

- Application Entity Title
- IP Address
- SCP Port number

Selectable by System Option or Device File setting:

- US Regions Scaling Sequence
- Use of VOI LUT (Window Level = 256, and Window Center = 128)
- RGB as Planar or Pixel Interleave (Color-by-plane or Color-by-pixel)
- Network Read / Write Timeouts

6. Support of Extended Character Sets

Extended character sets are not supported.

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