	REV	REVISION STATUS		EFF. DATE
REVISION STATUS	A	Initial Release		
	B	Additions: VOI LUT; magnification type; birth date; image type; institution name, New SOPs, pixel interleave planar configuration, include lossy image compression tag.		
		Corrections: Association 'keep-alive' film sizes supported.		
		Document relayout.		
	C	Added Modality Worklist support re-organized Storage section Tag and Type fields; changed Patient Name field detail, changed Patient ID field length, added Patient Sex entries.		
	D	Added Modality Performed Procedure Step (MPPS) Storage Commitment (SC) DICOM Features.		
		Added Requested Procedure Code Sequence to Returned Key attributes for MWL; replaced MWL Attribute table.		
		Corrected Storage Modules order, and selected tags.		
	E	Added OB-GYN Structured Reporting		
		Changed MWL and MPPS sections		

DOCUMENT TITLE

HDI 5000 DICOM Conformance Statement

DOCUMENT PURPOSE:

The purpose of this document is to specify the DICOM conformance of the ATL HDI 5000, software version 210.x.x, Level 10.5.5, with APM.

APPROVALS

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PHILIPS MEDICAL SYSTEMS **Ultrasound** **Bothell, Washington** **98041-3003**	Document Number	REV	Sheet
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0. Introduction

This document describes the PHILIPS HDI® 5000 Ultrasound System's conformance to the ACR-NEMA DICOM 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 communicate using the DICOM protocol with Service Class Providers for Storage and Storage Commitment, Modality Worklist and Modality Performed Procedure Step, and Print.

0.1   Definitions

AE	Application Entity	PDE	Patient Data Entry (UI)
ANSI	American National Standards Institute	PDU	Protocol Data Unit
APM	Advanced Processing Module	SC	Storage Commitment
CID	Context ID	SCU	Service Class User - (Client)
CIS	Clinical Information System	SCP	Service Class Provider - (Server)
DOD	Department of Defense	SOP	Service - Object Pair
HDI	High Definition Imaging	SR	Structured Report
DICOM	Digital Imaging and Communications In	TID	Template ID
Medicine		UID	Unique Identifier
DIMSE	DICOM Message Service Element	VR	Value Representation
IOD	Information Object Definition		
MWL	Modality Worklist		
MPPS (PPS)	Modality Performed Procedure Step		

This document is written with respect to the **D**igital **I**maging and **Co**mmunications in **M**edicine (DICOM) version number 3.0.

1. Implementation Model

The HDI 5000 NetLink feature incorporates the DICOM 3.0 standard for networked **Image Printing, Image Storage, and Structured Report Storage**, **Modality Worklist** query, **Performed Procedure Step** and **Storage Commitment** functions as an SCU. The **Verification** SOP Class may be either SCU or SCP.

The HDI 5000 ultrasound system transfers images using DICOM network connections to **printer** or **storage** devices. The system configuration may specify that image transfer begin at the "End of Exam", or after each image is acquired. If "After Each Image", each image is held for optional deletion in case the user wishes to undo the store. The first image 'stored' or 'printed' is sent from the system only after the second image is acquired. This process continues for the entire study. The "Send" softkey, active in the report review page, initiates transfer of the Structured Report.

> For printing, the system tracks the number of images in the selected page format, and automatically sends a print command (N-Action) when enough images are queued to fill a page. The study continues in this manner until "End Exam" is pressed when the last image is sent along with a print command.

> Freezing the system and storing a Multiframe (cineloop) has no effect on the print queue.

> For storage, single frame and Multiframe images will be sent (exported) upon capture of the next image.

Scheduled Procedure Steps returned from the **Modality Worklist** server allow the operator to select which requested procedure to perform. The data returned from the query includes patient demographic data that the operator is no longer required to enter manually. Additional patient information sent from the Modality Worklist server not displayed in the system UI, is passed on to the storage server with the associated images.

Performed Procedure Step (PPS) allows the Clinical Information System (CIS) to track the performance of the scheduled procedure entered into the system via the **Modality Worklist** function. PPS 'closes' the Requested Procedure / Performed Procedure information loop to the CIS. Messages are also sent for unscheduled exams.

Storage Commitment allows the ultrasound system to request a **storage** AE to commit to storage and safekeeping of exams generated by the system. This commitment allows the system user to effectively manage exams on the system's hard drive.

The **Verification SOP** class acts as both **SCU and SCP**. The system acts as an SCU for Verification for all AE's except print. The system will respond to a Verification Request as an SCP when a remote device queries it.

1.1 Application Data Flow Diagram

Figure 1.1-1 represents the relationship between the ultrasound system's real-world activities (in circles) that invoke of the NetLink device's Application Entity's local use of DICOM on the left side, and depicts the remote DICOM destination AE's on the right side. All Application Entities are in boxes.

The following are descriptions of the system's handling of associations for each of the DICOM features.

Image Printing
Upon completion of New Patient data entry, the Print AE initiates separate associations to the print server(s) to verify their on-line status. After selecting a device, the association is closed after receiving status. When Patient Data entry is completed, another association is made, which is also closed. When the study is started and the first image is sent, the association(s) remain open for the remainder of the study. The N_Get Status command is used automatically every two minutes of idle time during the study to ensure that the print server(s) remain on-line during this time. When the End Exam command is invoked, any partially filled sheet of film is printed and the association(s) is (are) closed.

Image Storage
When the user selects a Storage (Archive) destination, the Storing AE will initiate a separate association to each selected storage server to verify its on-line status and the association(s) is (are) closed. This system repeats this

verification sequence upon completion of Patient Data entry and just prior to the transfer of the first image in the exam.   When the End Exam command is invoked, the last image is sent, and the association(s) is (are) closed.

Structured Report Storage
The "SEND" softkey, active during report page display, initiates transfer of the report document. After changes to the report data during the exam, the SR document will contain the updated changes.

Reviewing the report after ending the exam and starting a new patient is not available on the system. However, the report is maintained on the system hard drive and may be sent by selecting Patient Directory using "Net/Disk>Hard Drive" and selecting the patient for transfer to Network Storage device. All images and the report will be sent for the selected patient. Select the study from the system hard drive directory and select "Copy To…" Network.

When the Structured Report (SR Archive) Archive is selected in the Network configuration screen, the HDI will immediately attempt to open and close an association to verify network connection.

Storage Commitment
The ultrasound system generates an N-Action to request Storage Commitment (SC) by the SC server AE after the last image of the exam is spooled. The N-Action Request contains a transaction UID and a list of the SOP Instances stored. The system then closes the association and waits for a reply from the SC server. The SCP opens the association using reverse-role negotiation, and sends an N-Event Report containing the image transaction UID and SOP Instance UIDs that were successfully committed and if applicable, a list of those that were not.

Modality Worklist
MWL queries are configured at preset intervals, and / or at user discretion, and automatically on power up. The MWL SCU AE sends a Basic Worklist Service Class DIMSE-C C-FIND Request to query the MWL SCP for matching key attributes. An association is opened for the query, and closed when the results are returned.

Performed Procedure Step
As the first image of a procedure is sent, the system sends an N-Create containing all of the tags that will be populated when the final N-Set is sent at the end of the procedure. The N-Set containing all populated fields is sent after using the "New Patient" softkey in the Patient Data Entry screen. The exam start time is when the Patient Data Entry screen was closed.

Verification SCP
The ultrasound system now employs a Verification SCP to reply to verification requests sent by remote devices. This allows the remote devices to ensure the availability of each ultrasound system on the network, within the constraints of the network topology, and timeout values. The system must be powered on with the network cable already attached to the network connection in order for the system to respond to an echo request. This feature allows compatibility with DOD Modality Interface requirements.

> General Notes:
> A DICOM Verify, employing DIMSE Service C-ECHO (for Storage, Worklist, Performed Procedure Step and Storage Commitment devices), and N_GET Status (for Print devices) is issued upon completion of power up when network devices are already selected in the system. These associations are created and closed when the response is complete.
>
> Verify is also executed on initial selection of the device, and after completion of Patient Data entry.

The following tables describe Association Negotiation and Association status for each group of DICOM services supported by the HDI 5000 when connected to the network.

> Note: When returning from portable, the system will attempt reconnecting the selected devices, and perform any spooled events including storage, printing, PPS, SC and any automatic Modality Worklist queries. Store and print will perform batch transfers like "Store at End of Exam".

Table 1.1-1 Image Store and Print Association Negotiation - Association Status (After Each Image)

User Action	DICOM Activity - Store	DICOM Activity - Print	Association Status
Select Device	Association Negotiation, C-ECHO, then Association Release Request	Association Negotiation + N_Create Film Session and N_Create Film Box, N_GET Status then two N_Deletes, then Association Release Request	Association(s) closed.
Complete Patient Data Entry	Association Negotiation, C-ECHO, then Association Release Request	Association Negotiation + N_Create Film Session and N_Create Film Box, N_GET Status then two N_Deletes, then Association Release Request	Association(s) closed.
First image sent from system	Association Negotiation, C-ECHO then C-Store until End Exam when Association Release Request is sent.	Association Negotiation + N_Create Film Session and N_Create Film Box, N_GET Status then N_Sets for each image and N_Action for each page and End of Exam, two N_Deletes, then Association Release Request	Association(s) remain(s) open until End of Exam, then closes after last image.

Table 1.1-2 Image Store and Print Association Negotiation - Association Status (End of Exam)

User Action	DICOM Activity - Store	DICOM Activity - Print	Association Status
Select Device	Association Negotiation, C-ECHO, then Association Release Request	Association Negotiation + N_Create Film Session and N_Create Film Box, N_GET Status then two N_Deletes, then Association Release Request	Association(s) closed.
Complete Patient Data Entry	Association Negotiation, C-ECHO, then Association Release Request	Association Negotiation + N_Create Film Session and N_Create Film Box, N_GET Status then two N_Deletes, then Association Release Request	Association(s) closed.
End of Exam	Association Negotiation, C-ECHO then C-Store until all images sent, then Association Release Request is sent.	Association Negotiation + N_Create Film Session and N_Create Film Box, N_GET Status then N_Sets for each image and N_Action for each page, two N_Deletes, then Association Release Request	Association(s) remain (s) open until last image is sent, then closes.

Table 1.1-3 Structured Report (SR) Store Association Negotiation - Association Status (APM required)

User Action	DICOM Activity - Store	Association Status
Select Device	Association Negotiation, then Association Release Request	Association closed.
Complete Patient Data Entry	Association Negotiation, then Association Release Request	Association closed.
"Send" button in Report review	Association Negotiation, then C-Store report, then Association Release Request is sent.	Association closed.

Table 1-1.4 Modality Worklist Association Behavior

User Action	DICOM Activity - Modality Worklist Device Association	Association Status
Select Device; any setup window change, selecting patient.	Association Negotiation, C-ECHO, then Association Release Request	Association closed.
System Auto Query	Association Negotiation, followed by a C-FIND for selected query attributes. After transfer of responses, Association Release Request	Association closed.
Manual / User Query	Association Negotiation, followed by a C-FIND for selected query attributes. After transfer of responses, Association Release Request	Association closed.

Table 1-1.5 Performed Procedure Step Association Behavior

User Action	DICOM Activity - Performed Procedure Step Device Association	Association Status
Select Device	Association Negotiation, C-ECHO, then Association Release Request	Association closed.
Acquire First Image	Association Negotiation, N-Create Request sent. When response is received, then Association Release Request	Association closed.
Start of New Exam	Association Negotiation, N-Set Request is sent with either "Complete" or "Discontinued" status, then Association Release Request	Association closed.

Table 1-1.6   Storage Commitment Association Behavior

User Action	DICOM Activity – Storage Commitment Device Association	Association Status
Select Device	Association Negotiation, C-ECHO, then Association Release Request	Association closed.
Complete Patient Data Entry	Association Negotiation, C-ECHO, then Association Release Request	Association closed.
End Exam	After PPS N-Set and all images have been spooled, the system will initiate an association with the SC server, and send an N-Action Request, containing a list of all images to be stored. Then Association Release Request.	Association closed.
Reverse Role Negotiation	The system will remain available as long as it is connected to the network to receive Storage Commitment responses from the SC server. The SCP will send an N-Event Report with status. Then the association is released.	Association closed.

Table 1-1.7   Verification SCP Association Behavior

Action	DICOM Activity - Verification SCP Association	Association Status
Remote Echo Request	System has Verification SCP running in the background listening on Port 104 for Verify requests.	None.
System response	System generates C-Echo response to the Verify request. The association is closed when the communication is complete.	Association closed.

Figure 1.1-1   Implementation Model
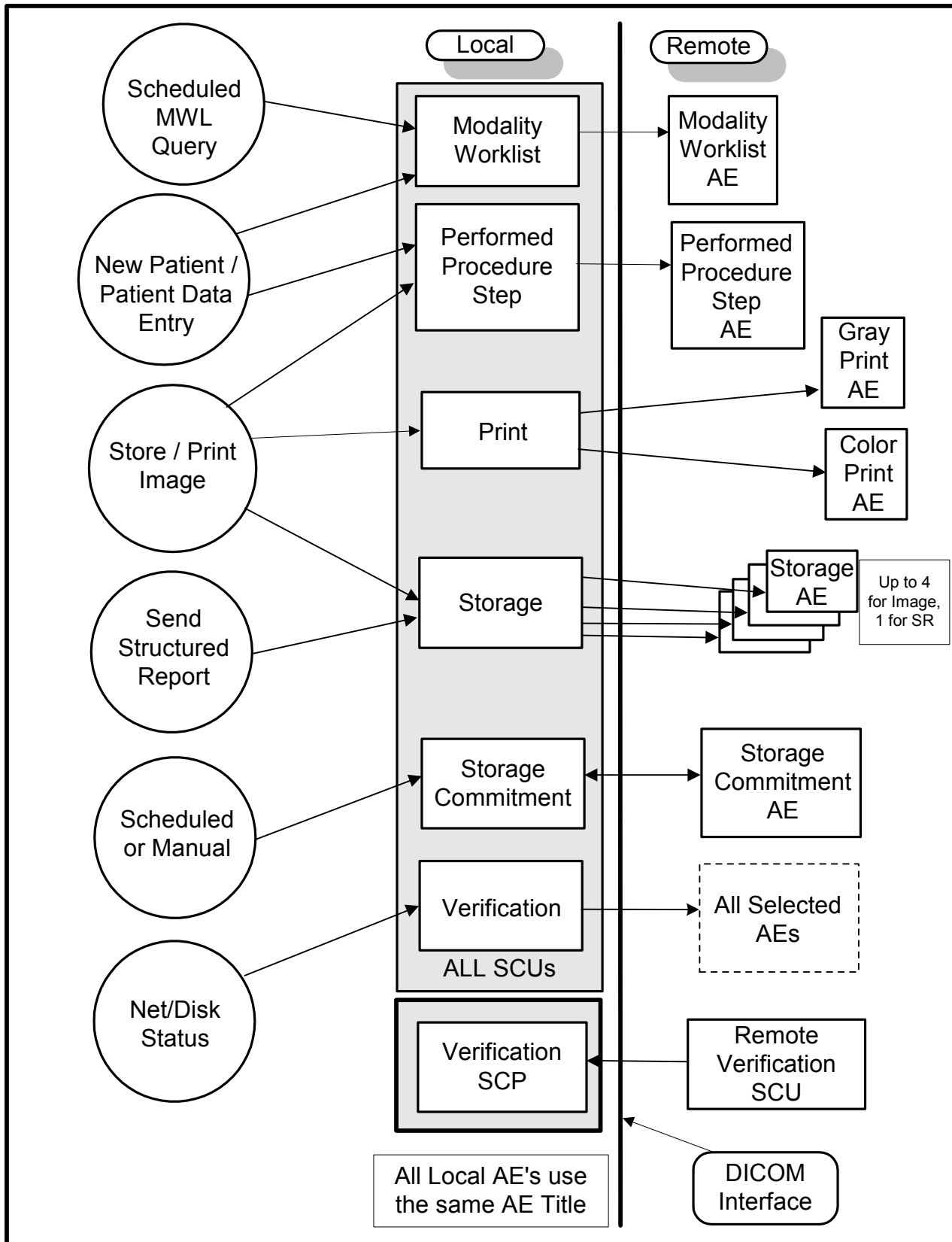
All Print, Store, MWL, PPS and Storage Commit. AE's on the HDI system are the SCU role, share the same AE title and use Verification as an SCU. The Verification SCP and SC SCU use Port 104 and also use the same AE Title.

1.2   Functional Definitions of AE's

Printing
This AE handles all aspects of the Print Management SCU.

Storing
This AE handles sending ultrasound images to a storage server using the DICOM C-Store Services as an SCU. The remote SCP must support the Verification on the same association.

Modality Worklist
This AE handles querying the Modality Worklist server as an SCU using the DICOM Basic Modality Worklist Service Class DIMSE-C C-FIND service. It locates and retrieves study requests that match user defined criteria. The remote SCP must support Verification.

Performed Procedure Step
This AE handles sending of N-Create and N-Set messages to the PPS server. The PPS SCU sends an N-Create at the beginning of a procedure and at the completion of a procedure, an N-Set is sent containing updated information about the exam along with "Completed" or "Discontinued" status. The remote SCP must support Verification.

Storage Commitment
This AE handles communications between the ultrasound system and the SC server. At the completion of the procedure, an N-Action Request is sent listing the IDs of the stored images. When storage commitment is completed, the SC server must 'inform' the SCU of the status update. This communication is accomplished using a reverse-role negotiation, where the remote SCP initiates communication to the SCU to send and N-Event Report that contains the new status. The ultrasound system displays status of "Commit – Yes", informing the user they may delete the study from its hard drive.

Send Structured Report
The Structured Report AE sends a C-Store object to the storage SCP using the Comprehensive SR SOP Class when the "SEND" softkey on the control panel. The AE initiates an association request containing negotiation for the Comprehensive SR SOP Class and Verification SOP Class. Upon receiving a successful association negotiation response, the AE sends the report.

Verification
The system acts as either SCU or SCP for Verification. It responds to C-ECHOs sent by remote devices to ensure that it is working and available.

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. The destination device(s) must have successfully responded Association Negotiation and to the N_Get Status (printers) or C-Echo (storage and MWL) prior to use. To send a Structured Report, the user must use the "Send" button in the report review screen.

An association for Modality Worklist is made when the automatic or user initiated query is executed.

An association for PPS is made when the remote device is selected, and prior to any communication with the PPS server. After the information is transferred, the association will close.

An association for SC occurs at selection of the SC remote device. The system listens for reverse-role association made from the SC server when the procedure successfully committed for storage.

Associations are also initiated in certain circumstances upon system power up or connection to the network, as in Auto-Send on Reconnect.

1.3.1 Differences between Image and SR C-Store headers

If the patient data fields "Last Name", "First Name", "ID", "Gender" or "LMP" are edited during the exam, the changed information may be sent in the SR object header and any content fields, but will not be changed in the Image headers.

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

Each of the SOP Classes employed by the Print Meta SOP Classes use the following data:

TAG Names	Tag Number	Contents
SOP Class UID	0008,0016	Same as Command Set
SOP Instance UID	0008,0018	Same as Command Set

2.1.1 Association Establishment Policies

The Printing AE initiates an association when the user completes New Patient / Patient Data Entry. The Gray and Color SOP Print Management Service Class connections occur on separate associations. The Printing AE uses an N-Get Status to verify that an association is still active even though no printing is taking place.

2.1.1.1 General

Maximum PDU size offered: 65,526 bytes
Minimum PDU size offered: 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 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 does not use asynchronous operations.

2.1.1.4 Implementation Identifying Information

Implementation Class UID: "1.2.840.113663"
Implementation Version name: "Tiller_v101"

Notes: "113663" is registered with ANSI, originally by ATL, now by Philips Medical Systems.

2.1.2 Association Initiation by Real-World Activity

The Printing AE opens associations to the Gray Print Server and to the Color Print Server when the real-world activity occurs when the user completes New Patient / Patient Data Entry or Select Printer.

2.1.2.1   Association Initiation by: New Patient

The completion of New Patient / Patient Data Entry causes initiation of separate associations with a Gray Print Server and /or a Color Print Server. These two associations may be handled by one device but are managed separately by the Printing AE.

2.1.2.2   Association Initiation by: Select Printer

The completion of Select Printer initiates 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
Name	UID	Name List	UID List		Negotiation
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

2.1.3.1   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.

2.1.3.2   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. Request data set contains no SOP Instance UID. Affected SOP Instance UID is returned from printer.
N-Delete	U	Deletes the film session

Supported SOP Class Elements

Name	Tag	Usage	Range	Description
Number of Copies	2000,0010	U	1 to x	Number of copies of film; max set in device file
Print Priority	2000,0020	U	MED only	Fixed value
Medium Type	2000,0030	U	Paper, Clear Film Blue Film	Printer may further restrict range. Configurable via device file and setups UI.
Film Destination	2000,0040	U	Magazine, Processor	Printer may further restrict range. Configurable via device file and setups UI.

2.1.3.3   SOP Specific Conformance to Basic Film Box SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Create	M	Creates the film box. SOP Instance UID is sent empty in N-Create-RQ. N-Create-Rsp from printer contains Referenced Film Session and Image Box Sequences using Affected SOP Instance UIDs generated by the printer.
N-Delete	U	Deletes the film box. Used after each film is printed.

Name	Usage	Description		
N-Action	M	PRINT. Sent after each filling of a film box and also at the end of the study if one or more images have been transferred into the film box.		

Supported SOP Class Elements

Name	Tag	Usage	Range	Description
Image Display Format	2010,0010	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	Printer may further restrict range. No additional formats are supported.
Referenced Film Session Sequence	2010,0500	M		Used.
>Referenced SOP Class UID	0008,1150	M	1.2.840.10008.5.1.1.1	Film Session SOP Class UID
>Referenced SOP Instance UID	0008,1155	M	Uses Affected SOP Instance UID received from printer in Film Session N-Created Rsp.	Referenced Film Session SOP.
Film Orientation	2010,0040	U	Portrait Landscape	Printer may further restrict range.
Film Size ID	2010,0050	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	Printer may further restrict range. No additional sizes are supported.
Magnification Type	2010,0060	U	None, Bilinear, Cubic, Bicubic, Mitchell, Lanczos, Replicate	Configurable via device file. No UI field; must be set by device file edit.
Max Density	2010,0130	U	0 – 400, may be further limited by printer	Configured in UI from range presented in device file.
Configuration Information	2010,0150	U		Configurable via device file. No UI field; must be set by device file edit.
Border Density	2010,0100	U	0 – 400, may be further limited by printer	Configured in UI from range presented in device file. No support for text strings, "BLACK" or "WHITE".
Empty Image Density	2010,0110	U	0 – 400, may be further limited by printer	Configured in UI from range presented in device file. No support for text strings, "BLACK" or "WHITE".
Min Density	2010,0120	U	0 – x	Configured in UI from range presented in device file.

2.1.3.4   SOP Specific Conformance to Basic Grayscale Image Box SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Set	M	An image box SOP Instance UID is created by the SCP (printer or print server) for each potential image box of the film box – based on requested Image Display format. Only the instances that will actually contain images will be updated with the N_SET message.

Supported SOP Class Elements

Name	Tag	Usage	Range	Description
Image Position	2020,0010	M	1-n	Position of image on film box
Preformatted Grayscale Image Sequence	2020,0110	M		
>Samples Per Pixel	0028,0002	M	1	Only 1 for Monochrome
>Photometric Interpretation	0028,0004	M	MONOCHROME2	0 = black, 255 = white
>Rows	0028,0010	M	476 (NTSC), 576 (PAL)	
>Columns	0028,0011	M	640 (NTSC), 768 (PAL)	
>Pixel Aspect Ratio	0028,0034	M	68/68 (NTSC), 82/82 (PAL)	
>Bits Allocated	0028,0100	M	8	
>Bits Stored	0028,0101	M	8	
>High bit	0028,0102	M	7	
>Pixel Representation	0028,0103	M	0	
>Pixel Data	7FE0,0010	M		Gray pixel data for each image

2.1.3.5 SOP Specific Conformance to Printer SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Event-Report	M	Asynchronous input from the printer to this AE used to report changes in printer status. Received any time after association establishment and before association release or abort.
N-Get	U	Sent after N-Create of Film Box and after each N-Set. Sent every two minutes during an open association. Sent every time the user selects "Net/Disk > Status." The Attribute Identifier List is not sent indicating that all attributes are to be returned.

Supported SOP Class Elements
Note: The attribute description here indicates which attributes this device uses when the printer returns them.

Name	Tag	Usage	Range	Description
Printer Status	2110,0010	U	NORMAL WARNING FAILURE	Warning and Failure are reported to user.
Print Status Info	2110,0020	U		Reported to user by popup message window or text entry on status screen reached by Net/Disk > Status
Printer Name	2110,0030	U		Received but ignored
Manufacturer	0008,0070	U		Received but ignored
Manufacturer Model Name	0008,1090	U		Received but ignored
Device Serial Number	0018,1000	U		Received but ignored
Software Versions	0018,1020	U		Received but ignored
Date of Last Calibration	0018,1200	U		Received but ignored
Time of Last Calibration	0018,1201	U		Received but ignored

2.1.4 Proposed Presentation Context to a Color Print Server

Table 2.1.4-1   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

2.1.4.1 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

      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.

2.1.4.2 SOP Specific Conformance to Basic Color Image Box SOP Class

Supported DIMSE Services

Name	Usage	Description
N-Set	M	An image box SOP Instance UID is created by the SCP (printer or print server) for each potential image box of the film box – based on requested Image Display format. Only the instances that will actually contain images will be updated with the N_SET message.

Supported SOP Class Elements

Name	Tag	Usage	Range	Description
Image Position	2020,0010	M	1-n	Position of image on film box
Preformatted Color Image Sequence	2020,0111	M		
>Samples Per Pixel	0028,0002	M	3	R, G, and B
>Photometric Interpretation	0028,0004	M	RGB	
>Planar Configuration	0028,0006	M	1	Color by Plane
>Rows	0028,0010	M	476 (NTSC), 576 (PAL)	
>Columns	0028,0011	M	640 (NTSC), 768 (PAL)	
>Pixel Aspect Ratio	0028,0034	M	68/68 (NTSC), 82/82 (PAL)	
>Bits Allocated	0028,0100	M	8	
>Bits Stored	0028,0101	M	8	
>High Bit	0028,0102	M	7	
>Pixel Representation	0028,0103	M	0	
>Pixel Data	7FE0,0010	M		Color pixel data for each image.

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 Extended*
Ultrasound Image Storage SOP Class (retired)	1.2.840.10008.5.1.4.1.1.6	Standard Extended*
Ultrasound Multiframe Image SOP Class	1.2.840.10008.5.1.4.1.1.3.1	Standard Extended*
Ultrasound Multiframe Image SOP Class (retired)	1.2.840.10008.5.1.4.1.1.3	Standard Extended*
Comprehensive Structured Reporting	1.2.840.10008.5.1.4.1.1.88.33	Standard

* See Section 4 for description of extension to the standard SOP Class support.

Note: The choices of retired or new SOP Class or Implicit or Explicit VR Little Endian Transfer Syntax are configurable. The Verification SOP Class uses Implicit VR Little Endian Transfer Syntax, as DICOM requires.

2.2.1 Association Establishment Policies – Image Store

In "After Each Image", the Storing AE initiates an association at completion of New Patient / Patient Data Entry. When configured to store "At end of exam," the system will open the association at the end of the study, transfer the entire study, and close the association. If an error occurs and the connection is broken, the system periodically attempts re-association to transfer the remaining data, even after the occurrence of a power cycle.

2.2.1.1   General

Maximum PDU size offered: 65,536 bytes
Minimum PDU size accepted: 1,024 bytes

2.2.1.2   Number of Associations

Number of simultaneous associations: 4

Note that 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"
Implementation Version name: "Tiller_v101"

Notes: "113663" was originally registered with ANSI by ATL, now Philips Medical Systems.

2.2.2 Association Initiation by Real-World Activity

The Storing AE opens an association to the Storage Server when the user completes New Patient / Patient Data Entry or Select Storage Server(s).

2.2.2.1   Association Initiation by: New Patient

When the user completes New Patient / Patient Data Entry an association is initiated to a Storage Server(s).

2.2.2.2   Association Initiation by: Select Storage Server

The user selection of a Storage Server will cause an association to be initiated to the Storage Server(s).

2.2.3 Proposed Presentation Context to a Storage Server

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

Configuration uses one of the Single Frame SOPs alone or with the corresponding Multiframe SOP. Either Retired SOPs or New SOPs in pairs, but not mixed. The system should not be configured to attempt to use all four SOP classes for a single device. Configuration is therefore accomplished by selecting the appropriate set of Abstract Syntaxes, either current or retired, that are supported by the Storage SCP, according to its DICOM Conformance Statement. Generic Device Files (storage1.v1, storage2.v1, etc.) exist for use where a product-specific device file does not exist.

Configuration details are located in Section 5.2

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

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation

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	Any in Table 2.2.3-2	Any in Table 2.2.3-2	SCU	None
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Any in Table 2.2.3-2	Any in Table 2.2.3-2	SCU	None
Ultrasound Multiframe Image	1.2.840.10008.5.1.4.1.1.3.1	Any in Table 2.2.3-2	Any in Table 2.2.3-2	SCU	None
Ultrasound Multiframe Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	Any in Table 2.2.3-2	Any in Table 2.2.3-2	SCU	None
Comprehensive Structured Report	1.2.840.10008.5.1.4.1.1.88.33	Any in Table 2.2.3-2 *	Any in Table 2.2.3-2	SCU	None

* Not user selectable

Table 2.2.3-2   Storage AE Transfer Syntax Table

Transfer Syntax Options	
Name List	**UID List**
DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2
DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1

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

Note: Modality Worklist features will add specific tags in various modules of the Ultrasound Image IOD listed in this section.

- See Table 2.3.4-2 for attributes added by Modality Worklist.

The Ultrasound Image Storage AE uses the Ultrasound Image IOD Modules for both Ultrasound Image and Ultrasound Multiframe Image IODs as follows:

Ultrasound Image and Multi-frame 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
Palette Color Lookup Table	C	Not used
Contrast/bolus	C	Not used
Cine	C	Used (in Multiframe SOP only)
Multi-frame	C	Used (in Multiframe SOP only)
US Region Calibration	U	Used, if configured in specified device file. See Section 5.2.
US Image	M	Used
Overlay Plane	U	Not used
VOI LUT	U	Used, if configured in specified device file. See Section 5.2.

SOP Common	M	Used

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

Patient Module Elements

Name	Tag	Type	VR	Range	Description
Patient's Name	0010,0010	2	PN		From PDE UI or Worklist Patient Name may not be edited when using MWL.
Patient ID	0010,0020	2	LO	0 –18 characters	From PDE UI or Worklist Patient ID may not be edited when using MWL.
Patient's Birth Date	0010,0030	2	DA		From PDE UI or Worklist
Patient's Sex	0010,0040	2	CS	M, F or O or null	From PDE UI or Worklist Characters from other languages are not sent.
Other Patient Ids	0010,1000	3	LO		No UI field to display or edit. Sent null, unless provided by MWL server
Ethnic Group	0010,2160	3	SH		Null, unless provided by MWL server
Patient Comments	0010,4000	3	LT		Null, unless provided by MWL server

General Study Module Elements

Name	Tag	Type	VR	Range	Description
Study Instance UID	0020,000D	1	UI	xx	From Worklist, otherwise generated by system.
Study Date	0008,0020	2	DA	yyyymmdd	generated by system
Study Time	0008,0030	2	TM	hhmmss	generated by system
Referring Physician Name	0008,0090	2	PN		From Worklist or PDE, Referring MD
Study ID	0020,0010	2	SH	1 to N	System Generated exam number
Accession Number	0008,0050	2	SH	0 –16 characters	From PDE UI or Worklist Accession Number may not be edited when using MWL.
Study Description	0008,1030	3	LO		From PDE, Exam Type or Worklist May not be edited in Worklist
Physician(s) of Record	0008,1048	3	PN		From worklist if available.
Referenced Study Sequence	0008,1110	3	SQ		Used when returned with MWL Sent Null in Unscheduled exam
> Referenced SOP Class UID	0008,1150	1C	UI		1.2.840.10008.3.1.1.1
> Referenced SOP Instance UID	0008,1155	1C	UI		From worklist

Patient Study Module Elements

Name	Tag	Type	VR	Range	Description
Admitting Diagnosis Description	0008,1080	3	LO		No UI field to display or edit. Sent null, unless provided by MWL server
Patient Age	0010,1010	3	AS	nnnD, nnnM, nnnY	From PDE UI or Worklist Patient Age may not be edited when using MWL.
Patient's Size	0010,1020	3	DS		From PDE>Study Data UI or Worklist
Patient's Weight	0010,1030	3	DS		From PDE>Study Data UI or Worklist
Additional Patient's History	0010,21B0	3	LT		From PDE> Edit>Indications UI or Worklist

Patient Medical Module Attributes added - See Section 4.1.1

Name	Tag	Type	VR	Range	Description
Pregnancy Status	0010,21C0	3	US	0001, 0002,0003, 0004	Not, Possibly, Definately, Unknown. Only from worklist
Last Menstrual Date	0010,21D0	3	DA	nnnD, nnnW	From PDE UI or Worklist LMP field may be edited in Worklist

General Series Module Elements

Name	Tag	Type	VR	Range	Description
Modality	0008,0060	1	CS	US	Ultrasound
Series Instance UID	0020,000E	1	UI	xx	System generated
Series Number	0020,0011	2	IS	1	one series of images per study
Series Date	0008,0021	3	DA	yyyymmdd	Date series began
Series Time	0008,0031	3	TM	hhmmss	Time series began
Performing Physician's Name	0008,1050	3	PN		From "Sonographer's Name" in PDE or Scheduled Performing Physician's Name (0040,0006) in Worklist.
Protocol Name	0018,1030	3	LO	xx	Zero length
Series Description	0008,103E	3	LO	xx	From PDE "EXAM TYPE" field or Study Description tag (0008,1030) in MWL, else from preset. Exam Type may not be edited in MWL.
Operator's Name	0008,1070	3	PN		From "Sonographer's Name" in PDE or Worklist Scheduled Performing Physician's Name (0040,0006).
Referenced Study Component Sequence	0008,1111	3	SQ		
> Referenced SOP Class UID	0008,1150	1C	UI		1.2.840.10008.3.1.2.3.3
> Referenced SOP Instance UID	0008,1155	1C	UI		System Generated UID to identify the MPPS UID.
Requested Attributes Sequence	0040,0275	3	SQ		Not present in Unscheduled case
>Requested Procedure ID	0040,1001	1C	SH		
>Scheduled Procedure Step ID	0040,0009	1C	SH		
>Scheduled Procedure Step Description	0040,0007	3	LO		From worklist
>Performed Procedure Step Start Date	0040,0244	3	DA		
>Performed Procedure Step Start Time	0040,0245	3	TM		
>Performed Procedure Step Description	0040,0254	3	LO		
>Scheduled Action Item Code Sequence	0040,0008	3	SQ		
>>Code Value	0008,0100	1C	SH		
>>Coding Scheme Designator	0008,0102	1C	SH		
>>Code Meaning	0008,0104	3	SH		

General Equipment Module Elements

Name	Tag	Type	VR	Range	Description
Manufacturer	0008,0070	2	LO		ATL
Institution Name	0008,0080	3	LO		From Setups>Display
Station Name	0008,1010	3	SH		From Setups>Image Management> Network Configuration>System Info
Manufacturer's Model Name	0008,1090	3	LO	HDI 5000	
Software Version	0018,1020	3	LO		

General Image Module Elements

Name	Tag	Type	VR	Range	Description
Instance Number	0020,0013	2	IS	0-199	Number that identifies the image in the study
Patient Orientation	0020,0020	2C	CS		Zero length
Image Date	0008,0023	2C	DA	yyyymmdd	Date of image acquisition
Image Time	0008,0033	2C	TM	hhmmss	Time of image acquisition
Image Type	0008,0008	2	CS	ORIGINAL/ PRIMARY/ (blank)/*nnnn*	See **Image Attribute Descriptions** below

Image Comments	0020,4000	3	LT		First 20 characters of user annotation text or system imaging mode description, unless MWL patient.
Lossy Image Compression	0028,2112	1C	CS	00	

Image Attribute Descriptions

Image Type: This multi-value attribute is ORIGINAL/PRIMARY/(blank)/*nnnn*. The third field is **always** blank. The fourth field, *nnnn* is a bit map designating the image modes.

Value 4 is constructed as a modality bit map to allow for a description of multi-modality displays. In using this bit map, the sum of the values of the various modalities will unambiguously determine the constituent modalities.

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

Notes: 1. All Values are hexadecimal, encoded as a CS. The ultrasound image may contain a 2D Image portion in addition to a scrolling display. The fourth field is the sum of the codes for the corresponding image types in a multiple format image.

Image Pixel Module Elements

Name	Tag	Type	VR	Range	Description
Samples per Pixel	0028,0002	1	US	1/ 3	Gray / Color
Photometric Interpretation	0028,0004	1	CS	MONOCHROME2 / RGB	Gray / Color
Rows	0028,0010	1	US	476 (NTSC) 576 (PAL)	
Columns	0028,0011	1	US	640 (NTSC) 768 (PAL)	
Bits Allocated	0028,0100	1	US	8	
Bits Stored	0028,0101	1	US	8	
High Bit	0028,0102	1	US	7	
Pixel Representation	0028,0103	1	US	0000H	Unsigned integers
Pixel Data	7FE0,0010	1	OB	NTSC Gray SF ~ 300KB NTSC Color SF ~900KB NTSC Gray MF: ~600K – 13.5MB NTSC Color MF: ~1.8MB – 40.5MB PAL Gray SF ~ 440KB PAL Color SF ~ 1.3MB PAL Gray MF: ~880K – 19.8MB PAL Color MF: ~2.6MB – 58.5MB	
Planar Configuration	0028,0006	1C	US	0 1	0=Pixel Interleave 1=Planar (Configurable via device file edit. See Section 5.2)
Aspect Ratio	0028,0034	1C	IS	68/68 (NTSC) 82/82 (PAL)	Pixel aspect ratio

Cine Module Elements (Sent only in Multiframe SOP Class images)

Name	Tag	Type	VR	Attribute Description
Start Trim	0008,2142	3		
Stop Trim	0008,2143	3		
Frame Time Vector	0018,1065	1C	DS	Array of time increments (in msec) between frames.
Frame Delay	0018,1066	3	DS	Fixed at 0.0000
Preferred Playback Sequencing	0018,1244	3	US	Used for Multiframe

Multi-Frame Module Elements (Sent only in Multiframe SOP Class images)

Name	Tag	Type	VR	Range	Description
Number of Frames	0028,0008	1C	IS	2 - n	Grayscale Max = 90 frames, Color Max = 45 frames. Set in Setups>Image Management>General Options>Stored Loop Size
Frame Increment Pointer	0028,0009	1C	AT	0018, 1065	Frame Time Vector (Only)

US Region Calibration Module - Used if configured.

Name	Tag	Type	VR	Range	Description
Sequence of Ultrasound Regions	0018,6011	1	SQ		One sequence will exist for each region represented in the image. See **Region Calibration** note below.
Region Spatial Format	0018,6012	1	US		
Region Data Type	0018,6014	1	US		
Region Flags	0018,6016	1	UL		
Region Location Min X0	0018,6018	1	UL		
Region Location Min Y0	0018,601A	1	UL		
Region Location Max X1	0018,601C	1	UL		
Region Location Max Y1	0018,601E	1	UL		
Reference Pixel X	0018,6020	3	SL		
Reference Pixel Y	0018,6022	3	SL		
Physical Units X Direction	0018,6024	1	US		
Physical Units Y Direction	0018,6026	1	US		
Ref. Pixel Physical Value X	0018,6028	3	FD	null	
Ref. Pixel Physical Value Y	0018,602A	3	FD	null	
Physical Delta X	0018,602C	1	FD		
Physical Delta Y	0018,602E	1	FD		
Transducer Frequency	0018,6030	3	UL	doppler only	
Pulse Repetition Frequency	0018,6032	3	UL	doppler only	
Steering Angle	0018,6036	3	FD	doppler only	

Region Calibration Note

A full frame image has one sequence. An image with a 2D area and a scrolling area has two sequences, describing each region. ECG will add an additional sequence, but will be transparent. Maximum possible = 3 regions.

US Image Module Elements

Name	Tag	Type	VR	Range	Description
Samples Per Pixel	0028,0002	1	US	1 / 3	Gray / Color
Photometric Interpretation	0028,0004	1	CS	MONOCHROME2 / RGB	Gray / Color
Bits Allocated	0028,0100	1	US	8	
Bits Stored	0028,0101	1	US	8	
High Bit	0028,0102	1	US	7	
Planar Configuration	0028,0006	1C	US	0 1	0=Pixel Interleave 1=Planar (Configurable via device file edit. See Section 5.2)
Pixel Representation	0028,0103	1	US	0000H	Unsigned integers
Frame Increment Pointer	0028,0009	1C	AT	0018,1065 (only)	Frame time vector only and only in MF images
Image Type	0008,0008	2	CS	ORIGINAL / PRIMARY / (blank) / *nnnn*	See **Image Attribute Descriptions** below General Image Module
Lossy Image Compression	0028,2110	1C	CS	00	
Number Stages	0008,2124	2C	IS	0	
Number Views in Stage	0008,212A	2C	IS	0	
Ultrasound Color Data Present	0028,0014	3	US	0 / 1	Gray / Color
Stage Number	0008,2122	3	IS	0	
View Number	0008,2128	3	IS	0	
Number of Event Timers	0008,2129	3	IS	0	
Event Elapsed Time(s)	0008,2130	3	DS		Zero length
Trigger Time	0018,1060	3	DS	0000	

VOI LUT Element

Name	Tag	Type	VR	Range	Description
Window Center	0028,1050	3	DS	128	Presence is a configuration option
Window Width	0028,1051	1C	DS	256	Presence is a configuration option

SOP Common Module Elements

Name	Tag	Type	VR	Range	Description
SOP Class UID	0008,0016	1	UI	Same as in Command Set	
SOP Instance UID	0008,0018	1	UI	Same as in Command Set	

Note: "Re-sent" images maintain their original SOP Instance UID.

2.2.3.3 Storing AE Behavior to SCP Status

Storing AE Behavior to Status Returned from SCP

Status Value	Meaning	Description	Storing AE Behavoir
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. 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.

2.2.4 Association Establishment Policies – Structured Reporting Store

2.2.4.1 General

Maximum PDU size offered: 29,696 bytes
Minimum PDU size accepted: 4,096 bytes

2.2.4.2 Number of Associations

Number of simultaneous associations: 1

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

2.2.4.3 Asynchronous Nature

The Storing AE will not use asynchronous operations.

2.2.4.4 Implementation Identifying Information

Implementation Class UID: "2.16.840.1.x"
Implementation Version name: "MergeCOM3_251"

2.2.5 Association Initiation by Real-World Activity

The Comprehensive Structured Report (SR) Store AE opens an association to the Storage Server when the "Send" softkey is used.

2.2.5.1 Association Initiation by: New Patient

An association is initiated to a Storage Server when the user completes New Patient / Patient Data Entry.

2.2.5.2 Association Initiation by: Select SR Storage Server

User selection of the "SR Archive" causes an association to be initiated to a Storage Server supporting the Comprehensive Structured Report SOP Class.

2.2.6 Proposed Presentation Context to a Structured Reporting Storage Server

Table 2.2.6-1   Structured Reporting AE Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Comprehensive SR	1.2.840.10008.5.4.1.1.88.33	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

2.2.6.1 SOP Specific Conformance to Comprehensive Structured Report Storage SOP Class

The following table lists the modules included in the Comprehensive SR IOD. Compare to corresponding Image store tables.

Table 2.2.6.1-1 Comprehensive SR IOD Modules

IE	Module	Usage
Patient	Patient	M
	Specimen Identification	C - Not used
Study	General Study	M
	Patient Study	U
Series	SR Document Series	M
Equipment	General Equipment	M
Document	SR Document General	M
	SR Document Content	M
	SOP Common	M

2.2.6.2   Patient Module

Table 2.2.6.2-1 Patient Module Elements

Attribute Name	Tag	Type	Range	Attribute Description
Patient's Name	0010,0010	2	xx	From PDE UI or Worklist Patient Name may not be edited when using MWL.
Patient ID	0010,0020	2	0 –18 characters	From PDE UI or Worklist Patient ID may not be edited when using MWL.
Patient's Birth Date	0010,0030	2	xx	From PDE UI or Worklist
Patient's Sex	0010,0040	2	M, F or O or null	From PDE UI or Worklist Characters from other languages are not sent.
Other Patient Ids	0010,1000	3	xx	No UI field to display or edit. Sent null, unless provided by MWL server
Patient Comments	0010,4000	3	xx	Null, unless provided by MWL server

2.2.6.3   General Study Module

Table 2.2.6.3-1 General Study Module Elements

Attribute Name	Tag	Type	Range	Attribute Description
Study Instance UID	0020,000D	1	xx	From Worklist, otherwise generated by system.
Study Date	0008,0020	2	yyyymmdd	generated by system
Study Time	0008,0030	2	hhmmss	generated by system
Referring Physician Name	0008,0090	2		From Worklist or PDE Referring MD
Study ID	0020,0010	2	xx	System Generated exam number
Accession Number	0008,0050	2	0 –16 characters	From PDE UI or Worklist Accession Number may not be edited when using MWL.
Study Description	0008,1030	3	xx	From PDE, Exam Type or Worklist May not be edited in Worklist

2.2.6.4   Patient Study Module

Table 2.2.6.4-1   Patient Study Module Elements

Attribute Name	Tag	Type	Attribute Description
Patient's Size	0010,1020	3	From PDE>Study Data UI or Worklist
Patient's Weight	0010,1030	3	From PDE>Study Data UI or Worklist
Additional Patient's History	0010,21B0	3	From PDE> Edit>Indications UI or Worklist

2.2.6.5   SR Document Series Module

The following table lists the attributes included in the SR Document Series.

Table 2.2.6.5-1 SR Document Series Module Attributes

Attribute Name	Tag	Type	Attribute Description
Modality	0008,0060	1	SR = SR Document
Series Instance UID	0020,000E	1	System generated
Series Number	0020,0011	1	one series of reports per study

Referenced Study Component Sequence	0008,1111	2	
>Referenced SOP Class UID	0008,1150	1C	1.2.840.10008.3.1.2.3.3
> Referenced SOP Instance UID	0008,1155	1C	System Generated UID to identify the MPPS UID.

2.2.6.7 General Equipment Module

Table 2.2.6.7-1 General Equipment Module Attributes

Attribute Name	Tag	Type	Attribute Description
Manufacturer	0008,0070	2	"Philips Medical Systems"
Institution Name	0008,0080	3	From Setups>Display
Station Name	0008,1010	3	From Setups>Image Management>Network Configuration>System Info
Manufacturer's Model ID	0008,1090	3	"HDI 5000"
Software Version	0018,1020	3	

2.2.6.8 SR Document General Module

The following table lists the general attributes included in a SR Document Instance.

Table 2.2.6.8-1 SR Document General Module Attributes

Attribute Name	Tag	Type	Attribute Description
Instance Number	0020,0013	1	Always 1.
Completion Flag	0040,A491	1	PARTIAL = Partial content.
Verification Flag	0040,A493	1	UNVERIFIED
Content Date	0008,0023	1	The date the document content creation completed.
Content Time	0008,0033	1	The time the document content creation completed.
Study Instance UID	0020,000D	1	Unique identifier for the Study

2.2.6.9 SR Document Content Module

The following table lists the Attributes that specify a SR Document's contents.

Table 2.2.6.9-1 SR Document Content Module Attributes

Attribute Name	Tag	Type	Attribute Description
Content Template Sequence	0040,A504	1C	5000
Content Sequence	0040,A730	1C	Present
>			See Appendix A

2.2.6.10 SR Document SOP Common Module

SOP Common Module Elements

Name	Tag	Type	VR	Range	Description
SOP Class UID	0008,0016	1	UI	1.2.840.10008.5.1.4.1.1.88.33	Comprehensive SR
SOP Instance UID	0008,0018	1	UI	Same as in Command Set	Same as in Command Set

Note: "Re-sent" reports maintain the original SOP Instance UID.

2.2.6.11 Structured Report Store AE Behavior to SCP Status

Table 2.2.6.11-1 Structured Report Store AE Behavior to Status Returned from SCP

Status Value	Meaning	Description	Structured Report Store AE Behavoir
0000	Success		Upon successfully storing data to an archive server, the Structured Report Store AE will continue operation without user notification.
A7xx	Refused	Out of resources	The association is terminated. 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.

2.3 *Modality Worklist AE - Specification*

The Modality Worklist SOP Class in the Basic Worklist Service Class identifies the Modality Worklist Information Model, and the DIMSE-C operations supported. The following Standard SOP Class is used here:

SOP Class Name	SOP Class UID	Conformance Level
Modality Worklist Information Model – FIND	1.2.840.100008.5.1.4.31	Standard
Verification SOP Class	1.2.840.10008.1.1	Standard

2.3.1 Association Establishment Policies

The Modality Worklist AE initiates an association under several conditions. The user may manually initiate a Worklist Update using the settings of the Automatic Query to determine the search criteria, and then issue the C-FIND command to the Modality Worklist server. After the requested data is returned, the association is closed.

The system may be set for an automatic query to occur at intervals set by the user in the configuration screens.

2.3.1.1 General

Maximum PDU size offered: 65,536 bytes
Minimum PDU size accepted: 1,024 bytes

2.3.1.2 Number of Associations

Number of simultaneous associations for the Modality Worklist AE:

     1 for Modality Worklist - FIND

Note that other Application Entities in this device may be open simultaneously.

2.3.1.3 Asynchronous Nature

The Modality Worklist AE will not use asynchronous operations.

2.3.1.4 Implementation Identifying Information

Implementation Class UID: "1.2.840.113663"
Implementation Version name: "Tiller_v101"

Notes: "113663" was originally registered with ANSI by ATL, now Philips Medical Systems.

2.3.2 Association Initiation by Real-World Activity

The Modality Worklist AE opens an association when the user initiates Update List, New Patient or Selecting the Modality Worklist Server.

The Automatic Update feature queries the worklist when the system is powered up, and connected to the network. Worklist queries do not include a C-Echo prior to sending C-Find Requests. The system performs a C-ECHO upon completion of power up when Automatic Update is enabled.

2.3.2.1　Association Initiation by: Update List

To use Update List, the user must enter the PDE screen, and press "New Patient". The user invocation of Update List will cause an association to be initiated to the Worklist Server. This association will remain active as long as required to return the requested matches from the Worklist server, and then close.

2.3.2.2　Association Initiation by: New Patient

Use the Patient Data hardkey to open the PDE screen. Then invoke "New Patient" which will cause an End Exam to ensure that all previous study images are transmitted from the system. The Worklist AE will perform a C-FIND based on the parameters set in the configuration panel and return the matching procedures.

2.3.2.3　Association Initiation by: Select Modality Worklist Server

Upon exiting the configuration panel for selecting the Modality Worklist Server, the system will initiate a DICOM Verify and execute the C-FIND request.

2.3.3　Proposed Presentation Context to a Modality Worklist Server

Table 2.3.3-1　Modality Worklist AE Proposed Presentation Contexts to a Worklist Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Worklist Information Model – FIND	1.2.840.100008.5.1.4.31	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

2.3.3.1　SOP Specific Conformance to Verification SOP Class

The Modality Worklist 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 Worklist Service.

2.3.3.2　System Query Configuration Options

Table 2.3.3.2-1 System Query Configuration Options

Query Action	Location of Entry	Settings
Auto Query	Image Management / Network Configuration / Worklist Server / Define Query	On / Off
Query Interval	Image Management / Network Configuration / Worklist Server / Define Query	30 min. default (minimum = 15, maximum = 120 minutes in 15 min. increments)
When selecting "New Patient"	PDE Screen	Query criteria set in Define Query
Upon User Request (Search)	PDE Screen. After Worklist is present, and Patient Name, ID, Accession #, or specific date.	Query criteria set in PDE.

2.3.3.2.1 System Query Functions

Table 2.3.3.2.1-1   Data used for different system or user queries.

Query Type	Data Used	Located in:
• Auto Query • New Patient • Update List	• Uses current system date • System AE Title • Station Name • Station Location	• Setups / Display • Define Query Screen and Host Table • Define Query Screen • Define Query Screen
• Search (User Request)	• Patient Name (auto-appends (*)) • Patient ID (must be exact) • Accession Number (must be exact) • Date (must be exact) • Requested Procedure ID	• All in PDE screen

2.3.4 Modality Worklist AE Attributes

Note: The system will match a query for studies using the tags that are listed below with an (*) asterisk in the Matching Key Type field. The system will allow all keys listed to be returned, except for those listed as "Not used."

Table 2.3.4-1   Tags used as Matching Keys for C-Find Request

Attribute Name	Tag	Use
Accession Number	0008,0050	Accession Number query is entered from PDE>New Patient> Patient Search "Accession #". No wild card expressions.
Patient's Name	0010,0010	Patient Last Name query from PDE>New Patient> Patient Search "Last Name". May use wild card expressions.
Patient ID	0010,0020	Patient ID query from PDE>New Patient> Patient Search "ID". No wildcard expressions.
> Modality	0008,0060	US - Fixed value.
> Scheduled Station AE Title	0040,0001	Station AE Title search from Setups>Image Management>Network Configuration>System Info. Selection found in Setups>Image Management>Network Configuration>Worklist Server>Define Query
> Scheduled Procedure Step Start Date	0040,0002	Defaults to current system date. Specific Start Date to locate is entered in PDE>New Patient> Patient Search "Date" field. No wildcard expressions.
> Scheduled Station Name	0040,0010	Station Name query from Setups>Image Management>Network Configuration>System Info. Enabled by selecting the option in Setups>Image Management>Network Configuration>Worklist Server>Define Query
> Scheduled Procedure Step Location	0040,0011	Location query from Setups>Image Management>Network Configuration>System Info. Enabled by selecting the option in Setups>Image Management>Network Configuration>Worklist Server>Define Query
Requested Procedure ID	0040,1001	Requested Procedure ID from PDE>New Patient> Patient Search "Procedure ID". No wildcard expressions.

Table 2.3.4-2   Support for tags returned from C-Find Response ("-" entry = not used)

Name	Tag	Persisted?	UI Location	UI Editable?	Added to Image	Added to SR
Specific Character Set	0008,0005	No	-	-	No	Yes
Accession Number	0008,0050	Yes	PDE> Accession #	No	Yes	Yes
Referring Physician's Name	0008,0090	Yes	PDE> Referring MD	Yes	Yes	Yes
Admitting Diagnosis	0008,1080	Yes	PDE>	Yes	Yes	No

Description			Indications			
Referenced Study Sequence	0008,1110	Yes	-	-	Yes	Yes
> Referenced SOP Class UID	0008,1150	Yes	-	-	Yes	Yes
> Referenced SOP Instance UID	0008,1155	-	-	-	Generated	Generated
> Referenced Patient Sequence	0008,1120	-	-	-	-	-
>> Referenced SOP Class UID	0008,1150	-	-	-	-	-
>> Referenced SOP Instance UID	0008,1155	-	-	-	-	-
Patient's Name	0010,0010	Yes	PDE> Name fields	No	Yes	Yes
Patient ID	0010,0020	Yes	PDE> ID	No	Yes	Yes
Patient's Birth Date	0010,0030	Yes	PDE> DOB	Yes	Yes	Yes
Patient's Sex	0010,0040	Yes	PDE> Gender	Yes	Yes	Yes
Other Patient IDs	0010,1000	Yes	-	No	Yes	Yes
Patient's Size	0010,1020	Yes	PDE> Height	Yes	Yes	Yes
Patient's Weight	0010,1030	Yes	PDE> Weight	Yes	Yes	Yes
Medical Alerts	0010,2000	-	-	-	-	-
Contrast Allergies	0010,2110	-	-	-	-	-
Ethnic Group	0010,2160	Yes	-	-	Yes	Yes
Additional Patient History	0010,21B0	Yes	PDE> Indications	Yes	Yes	Yes
Pregnancy Status	0010,21C0	Yes	-	-	Yes	No
Last Menstrual Date	0010,21D0	Yes	PDE> LMP	Yes	Yes	Only in Content not header
Patient Comments	0010,4000	Yes	-	-	Yes	Yes
Study Instance UID	0020,000D	Yes	-	-	Yes	Yes
Requesting Physician	0032,1032	-	-	-	-	-
Requested Procedure Description	0032,1060	-	-	-	-	-
Requested Procedure Code Sequence	0032,1064	-	-	-	-	-
> Code Value	0008,0100	-	-	-	-	-
> Coding Scheme Designator	0008,0102	-	-	-	-	-
> Code Meaning	0008,0104	-	-	-	-	-
Admission ID	0038,0010	-	-			
Special Needs	0038,0050	-	-	-	-	-
Current Patient Location	0038,0300	Yes	PDE> Patient Location	Yes	No	No
Patient State	0038,0500	-	-	-	-	-
Scheduled Procedure Step Sequence	0040,0100	Yes	-			
> Modality	0008,0060	Yes	-	-	Yes	Yes
> Requested Contrast Agent	0032,1070	-	-	-	-	-
> Scheduled Station AE Title	0040,0001	-	-	-	-	-
> Scheduled Procedure Step Start Date	0040,0002	-	-	-	-	-

Attribute Name	Tag					
> Scheduled Procedure Step Start Time	0040,0003	-	-	-	-	-
> Scheduled Performing Physician's Name	0040,0006	Yes	PDE> Sonographer	Yes	Operator's Name 0008,1070	Physician's(s) of Record 0008,1048
> Scheduled Procedure Step Description	0040,0007	Yes	No	No	Sched Proc Step Desc 0040,0007; Perf Proc Step Desc 0040,0254; Study Description 0008,1030; Series Desc 0008,103E	Study Description 0008,1030
> Scheduled Action Item Code Sequence	0040,0008	Yes	-	-	Yes	-
>> Code Value	0008,0100	-	-	-	-	-
>> Coding Scheme Designator	0008,0102	-	-	-	-	-
>> Code Meaning	0008,0104	-	-	-	-	-
> Scheduled Procedure Step ID	0040,0009	Yes	-	-	Yes	-
> Scheduled Station Name	0040,0010	Yes	-	-	Station Name 0008,1010	Station Name 0008,1010
> Scheduled Procedure Step Location	0040,0011	-	-	-	-	-
> Pre-Medication	0040,0012	-	-	-	-	-
Requested Procedure ID	0040,1001	Yes	-	-	and Study ID 0020,0010	Study ID 0020,0010
Requested Procedure Priority	0040,1003	-	-	-	-	-
Patient Transport Arrangements	0040,1004	-	-	-	-	-
Names of Intended Recipients of Results	0040,1010	Yes	-	-	Physicians of Record 0008,1048	-
Confidentiality Constraint on Patient Data Description	0040,3001	-	-	-	-	-

2.3.5 Modality Worklist AE Behavior to SCP Status (C-FIND Response)

Table 2.3.5-1   Modality Worklist AE Behavior to Status Returned from SCP

Status Value	Meaning	Related Fields	Description	Modality Worklist AE Behavoir
0000	Success	None	Matching is Complete. No final Identifier is supplied.	Upon successfully connecting to a Modality Worklist server, and retrieving the requested data, the Modality Worklist AE will continue operation without user notification.
A700	Refused	0000,0902	Out of resources	The association is terminated. The user is notified of the failure.
A900	Failed	0000,0901 0000,0902	Identifier does not match SOP class	Same as A7xx.
Cxxx	Failed	0000,0901 0000,0902	Unable to Process	Same as A7xx.
FE00	Cancel	None	Matching is Terminated due to Cancel request	Terminated due to a Cancel Request.
FF00	Pending	Identifier	Matches are continuing.	Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.

FF01	Pending	Identifier	Matches are continuing.	Warning that one or more Optional Keys were not supported for existence for this Identifier.

2.4   Modality Performed Procedure Step AE - Specification

The Modality Performed Procedure Step SOP Class is a portion of the Modality Worklist Management Service Class and uses DIMSE-N services. The following Standard SOP Class is used here:

SOP Class Name	SOP Class UID	Conformance Level
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Standard
Verification SOP Class	1.2.840.10008.1.1	Standard

2.4.1 Association Establishment Policies

The Modality Performed Procedure Step AE initiates an association under several conditions. After the data is sent, the association is closed.

2.4.1.1   General

Maximum PDU size accepted: 65,525 bytes
Minimum PDU size accepted: 1,024 bytes

2.4.1.2   Number of Associations

Number of simultaneous associations for the Modality Performed Procedure Step AE:

   1 for Modality Performed Procedure Step N-Create or N-Set.

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

2.4.1.3   Asynchronous Nature

The Modality Performed Procedure Step AE will not use asynchronous operations.

2.4.1.4   Implementation Identifying Information

Implementation Class UID: "1.2.840.113663"
Implementation Version name: "Tiller_v101"

Notes: "113663" was originally registered with ANSI by ATL, now Philips Medical Systems.

2.4.2 Association Initiation by Real-World Activity

The Modality Performed Procedure Step AE opens an association to the selected Modality Performed Procedure Step Server upon New Patient, selecting the Modality Performed Procedure Step Server in configuration, and upon ending the study.

2.4.2.1   Association Initiation by: New Patient

Upon exiting the New Patient and selecting a Scheduled Procedure Step. After capturing the first image, the system will initiate a DICOM Verify, followed by an N-Create containing all of the required tags and sequences that may be used in the procedure. The contents of some of the tags will not be known until the completion of the study and will be sent with a null value. Note: No PPS events will be sent for unscheduled studies.

2.4.2.2 Association Initiation by: Select Modality Performed Procedure Step Server

Upon exiting the configuration panel for selecting the Modality Performed Procedure Step Server, the system will initiate a DICOM Verify.

2.4.2.3 Association Initiation by: Ending Exam

Upon completion of the study, with either "Completed" or "Discontinued" status, an N-Set is sent to the Modality Performed Procedure Step Server with all data contained in the study. If the system is shut down during an active study, an N-Set with "Completed" status is sent prior to shutdown. If there is a power loss, the system will send a complete PPS N-Set to the PPS server, including the end of study timestamp at power loss.

2.4.3 Proposed Presentation Context to a MPPS Server

Table 2.4.3-1   Modality Performed Procedure Step AE Proposed Presentation Contexts to a MPPS Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	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

2.4.3.1 SOP Specific Conformance to Verification SOP Class

The Modality Performed Procedure Step AE provides standard conformance to the Verification SOP Class as an SCU.

2.4.4 Modality Performed Procedure Step Attribute States

Note: MPPS is available for all exams, selected via Modality Worklist and Unscheduled exam.
The system sends the N-Create when the first image is sent.
The system sends the "Final State" N-Set when the next "New Patient" is used.
The system does not send intermediate N-SET's.

Table 2.4.4-1   Modality Performed Procedure Step SOP Class Tag Use

Tags sent in N-CREATE and N-SET		Tag Contents
(0008,0060)	Modality	US
(0008,1032)	Procedure Code Sequence	Sequence below or Null in unscheduled case
>>(0008,0100)	Code Value	Value in sequence mapped
>>(0008,0102)	Coding Scheme Designator	Value in sequence mapped
>>(0008,0104)	Code Meaning	Value in sequence mapped
(0008,1120)	Referenced Patient Sequence	Null
(0010,0010)	Patient's Name *	From MWL or UI
(0010,0020)	Patient ID *	From MWL or UI
(0010,0030)	Patient's Birth Date *	From MWL or UI, else null
(0010,0040)	Patient's Sex *	From MWL or UI, else null
(0020,0010)	Study ID	System Generated
(0040,0241)	Performed Station AE Title	From Host Table
(0040,0242)	Performed Station Name	If set in Setups, else null
(0040,0243)	Performed Station Location	If set in Setups, else null
(0040,0244)	Performed Procedure Step Start Date	Current system date @ Start
(0040,0245)	Performed Procedure Step Start Time	Current system time @ Start
(0040,0250)	Performed Procedure Step End Date *	N-Create (null) / N-Set (Current system date @ End)
(0040,0251)	Performed Procedure Step End Time *	N-Create (null) / N-Set (Current system time @ End)
(0040,0252)	Performed Procedure Step Status	N-Create – "IN PROGRESS" / N-Set – "COMPLETED"

(0040,0253)	Performed Procedure Step ID	System Generated
(0040,0254)	Performed Procedure Step Description	Null unless entered in UI "Exam Type"
(0040,0255)	Performed Procedure Type Description	NULL
(0040,0260)	Performed Action Item Sequence	Sequence below or Null in unscheduled case
>>(0008,0100)	Code Value	Value in sequence mapped
>>(0008,0102)	Coding Scheme Designator	Value in sequence mapped
>>(0008,0104)	Code Meaning	Value in sequence mapped
(0040,0270)	Scheduled Step Attribute Sequence	
>(0008,0050)	Accession Number	From MWL or PDE
>(0008,1110)	Referenced Study Sequence	Null in unscheduled case
>>(0008,1150)	Referenced SOP Class UID	From MWL Server
>>(0008,1155)	Referenced SOP Instance UID	From MWL Server
>(0020,000d)	Study Instance UID	From MWL Server, else System Generated
>(0032,1060)	Requested Procedure Description	From MWL Server, else null
>(0040,0007)	Scheduled Procedure Step Description	From MWL Server, else from UI "Exam Type"
>(0040,0008)	Scheduled Action Item Code Sequence	Sequence below or Null in unscheduled case
>>(0008,0100)	Code Value	Value in sequence mapped
>>(0008,0102)	Coding Scheme Designator	Value in sequence mapped
>>(0008,0104)	Code Meaning	Value in sequence mapped
>(0040,0009)	Scheduled Procedure Step ID	From MWL, else null
>(0040,1001)	Requested Procedure ID	From MWL Server, else null
(0040,0340)	Performed Series Sequence *	N-Create (null) / N-Set (seq. below)
Additional Tags Sent Only in N-SET		
>(0008,0054)	Retrieve AE Title	NULL
>(0008,103e)	Series Description	Either mapped, or preset value
>(0008,1050)	Performing Physician's Name	From MWL, UI or null **
>(0008,1070)	Operators Name	From MWL, UI or null **
>(0008,1040)	Referenced Image Sequence	
>>(0008,1150)	Referenced SOP Class UID	SF / MF Image Store SOP Class
>>(0008,1155)	Referenced SOP Instance UID	SOP Instance of that Image
>(0018,1030)	Protocol Name	NONE
>(0020,000e)	Series Instance UID	Series Instance of the Image
>(0040,0220)	Ref. Standalone SOP Ins. Seq.	NULL

* Tag not sent in N-Set

** If from MWL, mapped from "Scheduled Performing Physician's Name" (0040,0006)

2.4.6 Modality Performed Procedure Step AE Behavior to SCP Status

Table 2.4.6-1   Modality Performed Procedure Step AE Behavior to Status Returned from SCP

Status Value	Meaning	Related Fields	Description	Modality Performed Procedure Step AE Behavoir
0000	Success	None		
A700	Refused	0000,0902	Out of resources	The association is terminated. The user is notified of the failure.
A900	Failed	0000,0901 0000,0902	Identifier does not match SOP class	Same as A7xx.
Cxxx	Failed	0000,0901 0000,0902	Unable to Process	Same as A7xx.
FE00	Cancel	None		
FF00	Pending	Identifier		
FF01	Pending	Identifier		

2.5 Storage Commitment AE - Specification

The Storage Commitment AE uses the Push Model for communicating Storage Commitment messages with a Storage Commitment server by sending N-Action Requests and receiving N-Event Reports. The Push Model includes the ability for the Storage Commitment server to contact the ultrasound system when an update message must be sent with the server initiating the network communication.

The following Standard SOP Class data for the Push Model is used here:

SOP Class Name	SOP Class UID	Conformance Level
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Standard
Storage Commitment Push Model SOP Instance Well-known SOP Instance UID	1.2.840.10008.1.20.1.1	Standard
Verification SOP Class (SCU)	1.2.840.10008.1.1	Standard

2.5.1 Association Establishment Policies

- The Storage Commitment (SC) AE will initiate an association under several conditions:
- On system power up when a SC server has already been selected
- At the completion of entering patient data, or selection of a scheduled procedure step using MWL
- After receiving success status of C-Store of a group of images, an association will be opened to the SC server using an N-Action Request to send the list of storage SOP Instance UIDs that have been stored
- When the SC server completes storage commitment, it will initiate and association with the ultrasound system to send an N-Event Report of the status of the storage commitment request.

2.5.1.1 General

Maximum PDU size offered: 65,536 bytes
Minimum PDU size accepted: 1,024 bytes

2.5.1.2 Number of Associations

Number of simultaneous associations for the Storage Commitment AE:

    1 for Storage Commitment either generating an N-Action Request or listening for an N-Event Report

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

2.5.1.3 Asynchronous Nature

The Storage Commitment AE may use asynchronous operations:

    The N-Event Report must occur on a different association than the N-Action operation.

2.5.1.4 Implementation Identifying Information

Implementation Class UID: "1.2.840.113663"
Implementation Version name: "Tiller_v101"

Note: "113663" was originally registered with ANSI by ATL, now Philips Medical Systems.

2.5.2 Association Initiation by Real-World Activity

The Storage Commitment AE opens an association to the selected Storage Commitment Server upon completion of New Patient, selecting the Storage Commitment Server, or by Reverse Role Negotiation; receiving an association request for an N-Event Report initiated by the server.

2.5.2.1   Association Initiation by: New Patient

Upon completion of patient data entry the HDI will use Verify to check for server availability.

2.5.2.2   Association Initiation by: Select Storage Commitment Server

Upon exiting the configuration panel for selecting the Storage Commitment Server, the system will initiate a DICOM Verify.

2.5.2.3   Association Initiation by: Reverse Role Negotiation

The Storage Commitment server (SCP) may initiate contact with the ultrasound system at any time after receiving the N-Action Request with an N-Event Report to return the status of the commitment outcome. This means that the ultrasound system accepts an association initiated by the SCP. The HDI will accept an association *only* from an SCP that sets the SCP/SCU Role Selection Negotiation, PDU 54H to correctly identify its role as SCP. The HDI will indicate acceptance of the association initiator as SCP in its association acceptance PDU 54 message.

2.5.3 Proposed Presentation Context to a Storage Commitment Server

Table 2.5.3-1   Storage Commitment AE Proposed Presentation Contexts to a Storage Commitment Server

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	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

2.5.3.1   SOP Specific Conformance to Verification SOP Class

The Storage Commitment 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 Commitment service.

2.5.4 Storage Commitment – N-Action Request Attributes

Table 2.5.4-1   Storage Commitment Request – N-Action-Rq Information

Action Type Name	Action Type ID	Attribute	Tag	Use
Request Storage Commitment	1	Transaction UID	0008,1195	System Generated
		Referenced SOP Sequence	0008,1199	
		>Referenced SOP Class UID	0008,1150	SF/MF Image store UID
		>Referenced SOP Instance UID	0008,1155	System Generated
		Referenced Study Component Sequence	0008,1111	
		>Referenced SOP Class UID	0008,1150	1.2.840.10008.3.1.2.3.3
		>Referenced SOP Instance UID	0008,1155	MPPS Inst. UID

2.5.5 Storage Commitment – N-Event Report Attributes

Table 2.5.5-1   Storage Commitment Result – N-Event Report Information

Event Type Name	Event Type ID	Attribute	Tag	Use
Storage Commitment Request Successful	1	Transaction UID	0008,1195	UID sent by the SCU
		Referenced SOP Sequence	0008,1199	

		>Referenced SOP Class UID	0008,1150	SF/MF SOP that succeeded
		>Referenced SOP Instance UID	0008,1155	Image Instance UIDs that succeeded
Storage Commitment Request Complete - Failures Exist	2	Transaction UID	0008,1195	UID sent by the SCU
		Referenced SOP Sequence	0008,1199	
		>Referenced SOP Class UID	0008,1150	SF/MF SOP that succeeded
		>Referenced SOP Instance UID	0008,1155	Image Instance UIDs that succeeded
		Failed SOP Sequence	0008,1198	SCP Generated
		>Referenced SOP Class UID	0008,1150	SF/MF SOP that failed
		>Referenced SOP Instance UID	0008,1155	Image Instance UIDs that failed
		>Failure Reason	0008,1197	SCP's reason for failure

2.5.6 Storage Commitment AE Behavior to SCP Status (N-Action Request)

Table 2.5.6-1   Storage Commitment AE Behavior to Status Returned from SCP

Status Value	Meaning	Related Fields	Description	Storage Commitment AE Behavoir
0000	Success	None		
A700	Refused	0000,0902	Out of resources	The association is terminated. The user is notified of the failure.
A900	Failed	0000,0901 0000,0902	Identifier does not match SOP class	Same as A7xx.
Cxxx	Failed	0000,0901 0000,0902	Unable to Process	Same as A7xx.
FE00	Cancel	None		
FF00	Pending	Identifier		
FF01	Pending	Identifier		

2.6   Verification SCP AE - Specification

The ultrasound system supports the Verification SOP Class as an SCP.

SOP Class Name	SOP Class UID	Conformance Level
Verification SOP Class	1.2.840.10008.1.1	Standard

2.6.1 Association Establishment Policies

The Verification SCP AE will initiate an association under several conditions.

2.6.1.1   General

Maximum PDU size offered: 65,536 bytes
Minimum PDU size accepted: 1,024 bytes

2.6.1.2   Number of Associations

Number of simultaneous associations for the Verification SCP AE:

   1 for Verification as an SCP

2.6.1.3   Asynchronous Nature

The Verification SCP AE will not use asynchronous operations.

2.6.1.4   Implementation Identifying Information

Implementation Class UID: "1.2.840.113663"
Implementation Version name: "Tiller_v101"

Note: "113663" was originally registered with ANSI by ATL, now Philips Medical Systems.

2.6.2 Association Initiation by Real-World Activity

The Verification SCP AE will be running from system power up to respond to Verification SOP Class requests.

2.6.3 Proposed Presentation Context for the Verification SCP

Table 2.6.3-1   Verification SCP AE Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None

2.6.3.1   SOP Specific Conformance to Verification SOP Class

The Verification SCP AE provides standard conformance to the Verification SOP Class as an SCP

2.7   OB-GYN Ultrasound Procedure Reports using Structured Reporting

Ultrasound Procedure Reports provide evidence for diagnostic interpretation: not the output, which is the physician's report. This section describes implementation of Supplement 26, Final Text version, to the DICOM Standard into the HDI 5000 with APM module to allow creation of OB-GYN Structured Reports.

See Appendix A for additional detail.

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 using appropriate AUI port transceiver adapter unit.

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

The following extensions to the Standard Ultrasound Image Store and Ultrasound Multiframe Image Store Sop Classes

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

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

4.1.1 Standard Extended/Specialized/Private SOPs

In all SOP Classes in the table above, the additions to the Standard Conformance Level are due to adding the following tags from the following modules, which are not part of the Ultrasound Image, or Multiframe Image Store Module lists:

Table 4.1.1-1   Patient Medical Module Attributes

Name	Tag	Type	VR	Range	Description
Pregnancy Status	0010,21C0	3	US		Pregnancy Status
Last Menstrual Date	0010,21D0	3	DA		Date of onset of last menstrual period

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 look up table loaded at installation or some other time.

5.2 Configurable Parameters

A group of tables contain the following configuration parameters. Files are found following this series of steps:

Setups hardkey > Information Management > Configuration Files > Edit > Host Table or Devices
or
Setups hardkey > Calculations > Analysis for Calcs.

Complete editing instructions are located in the system user's manual.

	Element	Edit Location
-	Application Entity Title	Host Table
-	IP Address	Host Table
-	Remote SCP Port number	Host Table
-	Abstract Syntax (SOP Class)	Device file name referenced by the Model ID used in the Host table
-	Station Name	Setups > Information Management > Network Configuration
-	Station Location	Setups > Information Management > Network Configuration
-	Custom mapping of Modality Worklist Return Key attribute values to C-Store Header tags	Call Customer Service for assistance in mapping tags
-	Structured Report Options	OB Calculations settings to set desired researcher for equations

Selectable by System Option or Device File setting:

Image Storage (Archive devices)
- Enabling US Regions Scaling Sequence
- Choosing RGB as Planar or Pixel Interleave (Color-by-plane or Color-by-pixel)
- Enabling VOI LUT (Fixed values: Window Level = 256, and Window Center = 128)
- Selecting Storage Transfer Syntax: Implicit only or adding Explicit VR Little Endian

Print devices (printers, print servers)
- Default Optical Density values for
  - Minimum Density, Maximum Density, Border Density and Empty Image density
- Maximum allowable values for Maximum Density
- Configuration Information
- Magnification (Applies only to Film Box)
- Display format. Only values presented in this DCS are supported.
- Film Orientation
- Film Sizes. Only values presented in this DCS are supported.
- Maximum Number of Copies supported for selection in UI
- Media Types supported

6.   Support of Extended Character Sets

HDI 5000 supports "Latin alphabet No.1", ISO_IR 100. Extended character sets are not supported.

Appendix A OB-GYN Structured Reports (SR)

A.1 Introduction

The product implements the OB-GYN templates of DICOM Supplement 26. This appendix describes the scope and manner that HDI 5000 measurements appear in DICOM reports.

The code tables of this Appendix follow the format convention of the DICOM Standard, Part 16 Annex C.

A.2 Clinical Scope

The supported measurements are in the OB and GYN/Fertility Calcs Menus (accessed with the "CALCS" hardkey with the appropriate transducer and preset selection) and report pages.

Figure A.2 -1 Calcs Menus

A.3 Measurements

The report contains select Information entered and reported on the OB report and summary report pages shown below.

Figure A.3-1 System OB Report Summary Page Example

Figure A.3-2 OB Report Summary and Comments Excerpt

- In the case of multiples fetuses the EDD exported is the earliest EDD.
- The comment originates from the comment on the GYN Report Page.
- The LMP comes from the Worklist or user entered from the Study Data entry form.
- EDD comes from the Worklist or user entered from the Study Data entry form.

Dates of the Summary section are from CID 12003 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11955-2	LMP
LN	11778-8	EDD
LN	11779-6	EDD from LMP
LN	11781-2	EDD from average ultrasound age

Fetus-specific measurement codes are from CID 12002 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11885-1	Gestational Age by LMP
LN	11888-5	Composite Ultrasound Age
LN	11727-5	Estimated Weight

Equations from CID 12014 used for Estimated Fetal Body Weight

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11756-4	EFW by AC, Campbell 1975
LN	11735-8	EFW by AC, BPD, FL, Hadlock 1985
LN	11732-5	EFW by AC, BPD, FL, HC, Hadlock 1985
LN	11751-5	EFW by AC, FL, Hadlock 1985
LN	11746-5	EFW by AC, FL, HC, Hadlock 1985
LN	11739-0	EFW by AC and BPD, Shepard 1982

The following code identifies the fetus comments of the fetus summary template (TID 5003).

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	121106	Comment

Comments from GYN report page are included in the report summary (TID 5002) using (121106, DCM, "Comment").

Figure A.3-3 GYN/FERT Report Summary and Comments Excerpt

A.3.1 Fetal Biometry Ratios

Figure A.3.1-1 Fetal Biometry Ratio Report Page Section

The biometry ratios from the report page use codes from CID 12004 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11947-9	HC/AC
LN	11871-1	FL/AC
LN	11872-9	FL/BPD
LN	11823-2	Cephalic Index

A.3.2 Fetal Biometry Measurements

Figure A.3.2-1 Fetal Biometry Calcs Menu and System Fetal Biometry Report Page

The measurement codes are from CID 12005 listed below. The report also includes the Mean indicated with a modifier of concept name (121401, DCM, "derivation") and value of (R-00317, SRT, "Mean")

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11979-2	Abdominal Circumference
LN	11818-2	Anterior-Posterior Abdominal Diameter
LN	11819-0	Anterior-Posterior Trunk Diameter
LN	11820-8	Biparietal Diameter
LN	11824-0	BPD area corrected
LN	11963-6	Femur Length
LN	11984-2	Head Circumference
LN	11851-3	Occipital-Frontal Diameter
LN	11862-0	Tranverse Abdominal Diamter

The code (18185-9, LN, "Gestational Age") identifies gestational age. The "Equation" or "Table of Values" concept modifier specifies the method of estimation from the list below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11892-7	AC, Hadlock 1984
LN	11902-4	BPD, Hadlock 1984
LN	33538-0	BPD, Hansmann 1986
LN	11905-7	BPD, Jeanty 1984
LN	11907-3	BPD, Sabbagha 1978
LN	11920-6	FL, Hadlock 1984
LN	33541-4	FL, Hansmann 1986
LN	11922-2	FL, Hohler 1982
LN	11923-0	FL, Jeanty 1984
LN	11932-1	HC, Hadlock 1984
LN	33543-0	HC, Hansmann 1986
LN	11910-7	CRL, Hadlock 1992
LN	33540-6	CRL, Hansmann 1986
LN	11913-1	CRL, Nelson 1981
LN	11914-9	CRL, Robinson 1975
LN	33107-4	GS, Nyberg 1992

A.3.3 Long Bones Measurements

Figure A.3.3-1 Fetal Long Bones Calcs Menu and System Fetal Long Bones Report Page

The measurement codes are from CID 12006 listed below.

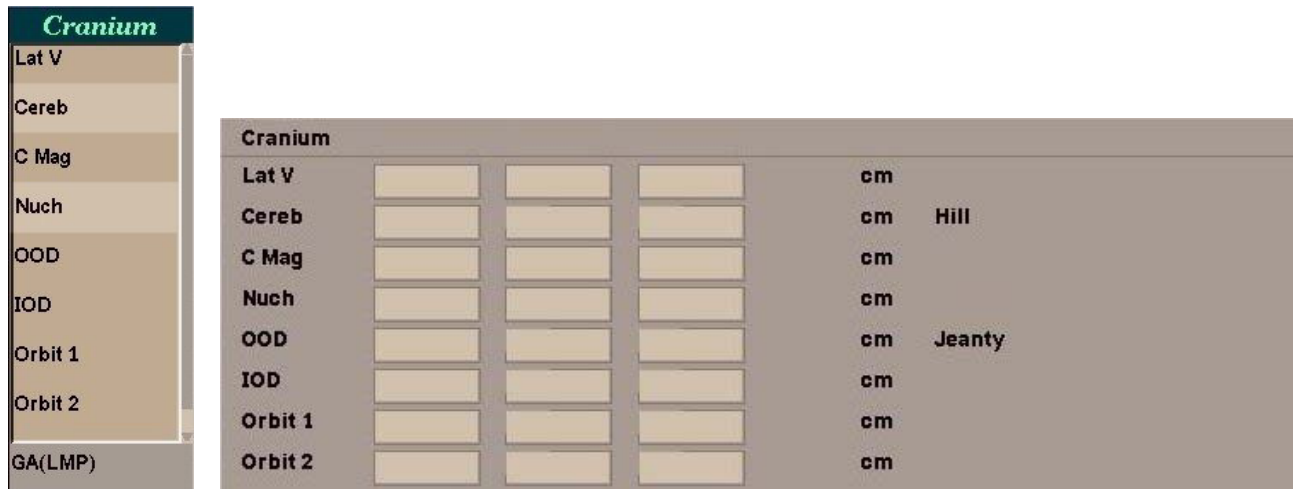| Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11966-9	Humerus length

A.3.4 Fetal Cranium

Figure A.3.4-1 Cranium Calcs Menu and System Fetal Cranium Report Page

The measurement codes corresponding to --*Nuch* and *Cereb* -- are from CID 12007 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	12146-7	Nuchal Fold Thickness
LN	11863-8	Trans Cerebellar Diameter

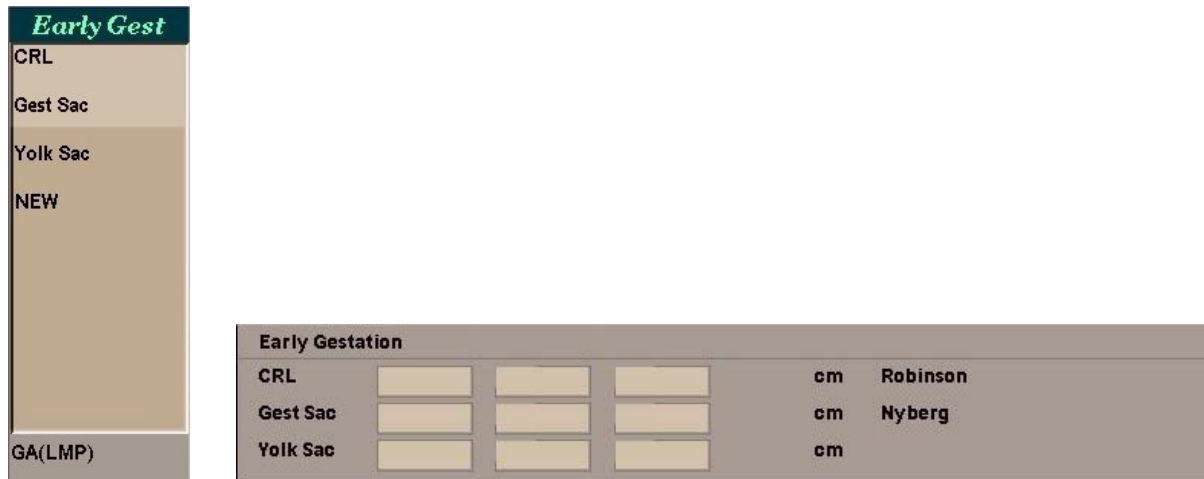### A.3.5 Early Gestation Biometry Measurements

Figure A.3.5-1 Early Gestation Calcs Menu and System Early Gestation Report Page

The measurement codes are from CID 12009 listed below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11957-8	Crown Rump Length
LN	11850-5	Gestational Sac Diameter

The gestational age is given by (18185-9, LN, "Gestational Age") with a modifier to identify the method of estimation. The codes from CID 12013 are shown below.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11910-7	CRL, Hadlock 1992
LN	33540-6	CRL, Hansmann 1986
LN	11913-1	CRL, Nelson 1981
LN	11914-9	CRL, Robinson 1975

LN	33107-4	GS, Nyberg 1992

A.3.6 Multiple Fetus and Fetal Observation Context

A.3.6.1   Structure Example of Multiple Fetus and Fetal Observation

For twins there are multiple sections of Summary, Fetal Biometry Ratios, Fetal Biometry, Long Bones, and Early Gestation. The DICOM report segregates fetus measurements into separate sections, and uses the fetus subject context template, TID 1008, to identify the fetus with the user entered identifier.

Figure A.3.6.1-1 System Twin A and Twin B Report Samples

The section heading has a modifier (11951-1, LN, "Fetus ID") to differentiate the fetuses in a multiple fetus case.

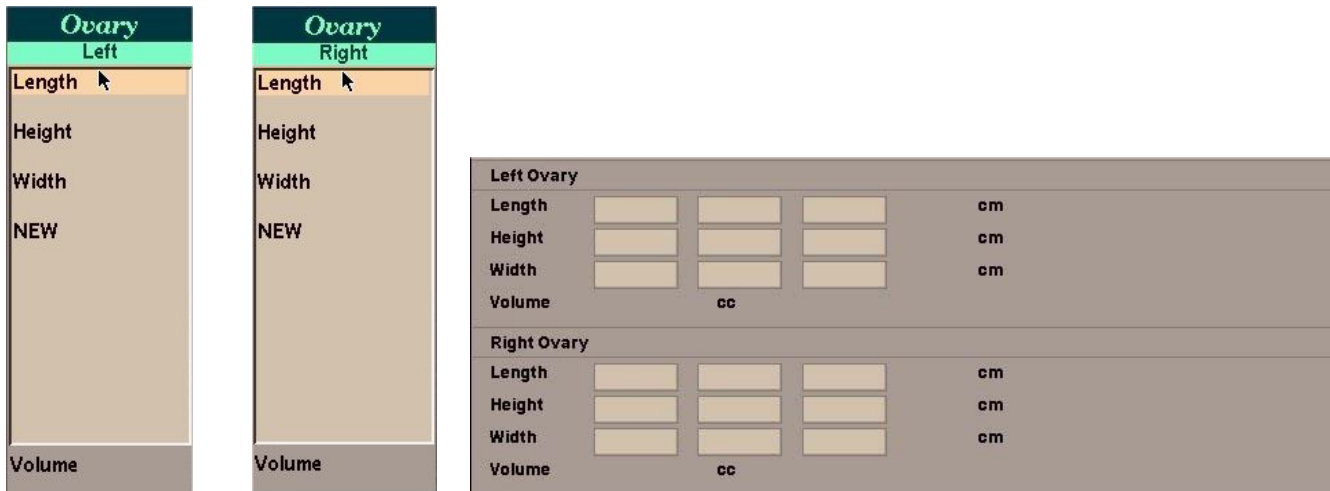| Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11951-1	Fetus ID

A.3.7 OB-GYN Ultrasound Ovary Measurements

Figure A.3.7-1 Ovary Calcs Menus and System Report Page

The codes below identify the ovary measurements using codes from CID 12010

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	12164-0	Left Ovary Volume
LN	11840-6	Left Ovary Length
LN	11829-9	Left Ovary Width
LN	11857-0	Left Ovary Height
LN	12165-7	Right Ovary Volume
LN	11841-4	Right Ovary Length
LN	11830-7	Right Ovary Width
LN	11858-8	Right Ovary Height

A.3.8 Uterus Measurements

Figure A.3.8-1 Uterus Calcs Menu and System Uterus Report Page Section

Only Length, Height, and Width values of TID 5015 are used.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	33192-6	Uterus Volume
LN	11842-2	Uterus Length
LN	11859-6	Uterus Height
LN	11865-3	Uterus Width

A.3.9 Follicles

Two Sections may be present, one for each laterality. Up to 15follicle measurement groups may appear in each Follicles Section. Each group has
- an identifier of the follicle group
- a mean diameter and volume for each follicle

Figure A.3.9-1 Follicles Calcs Menus and System Follicles Report Page Excerpt (Note: up to 15 supported) The sample is from the right ovary.

The following codes from TID 5014 are used.

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	12510	Identifier
SRT	G-D705	Volume
LN	11793-7	Follicle Diameter

A.3.10 Data not Exported in Structured Report

- User-defined measurements not supported
- User-defined tables / equations not supported

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