DICOM

Conformance Statement

HD11 XE
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PHILIPS

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Overview

The HD11 implements the necessary DICOM® services to download worklists from an information system, save acquired Ultrasound (US) images and associated Structured Reports to a network storage device, CD or MOD, print to a networked hardcopy device, and inform the information system about the work actually done. Table 1 provides an overview of the supported network services, Table 2 lists the supported Media Storage Application Profiles, and Table 3 lists the supported Structured Report Templates.

® DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

Table I
NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Ultrasound Image Storage	Yes	No
Ultrasound Multi-frame Image Storage	Yes	No
Storage Commitment Push Model SOP Class	Yes	No
Comprehensive SR	Yes	No
Query/Retrieve		
Workflow Management		
Modality Worklist Information Model - FIND	Yes	No
Modality Performed Procedure Step SOP Model	Yes	No
Print Management		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Basic Color Print Management Meta SOP Class	Yes	No
Basic Film Session SOP Class	Yes	No
Basic Film Box SOP Class	Yes	No
Basic Grayscale Image Box SOP Class	Yes	No
Basic Color Image Box SOP Class	Yes	No
Printer SOP Class	Yes	No

Table 2
MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR) (1)(2)
Compact Disk - Recordable		
STD-US-SC-SF&MF-CDR	Option	Option
Magneto-Optical Disk		
STD-US-SC-SF&MF-MOD128	Option	Option
STD-US-SC-SF&MF-MOD230	Option	Option
STD-US-SC-SF&MF-MOD540	Option	Option
STD-US-SC-SF&MF-MOD640	Option	Option
STD-US-SC-SF&MF-MOD13	Option	Option

(1) Structured Reports are not imported to the system.
(2) Only reads and imports data from other Philips HD11 or EnVisor systems.

Table 3
STRUCTURED REPORTS

Concept Name	Supported
OB-GYN Ultrasound Procedure Report	Yes
Echocardiography Procedure Report	Yes

Table of Contents

0. Introduction

This chapter provides general information about the purpose, scope and contents of this Conformance Statement.

0.1 Purpose of this Document

Context: Expansion of Headings and sub-headings

- Introduction
  - Purpose of this Document

The Digital Imaging and Communications in Medicine (DICOM) standard was originally developed by a joint committee of the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) to

"Facilitate the open exchange of information between digital imaging computers".

It specifies how medical images and related clinical information are passed between medical devices.

The DICOM Conformance Statement (DCS) is a required document for any device that claims conformance to DICOM. Since the DICOM standard specifies the structure and content of this document (PS3.2-2004) a DCS describes the DICOM capabilities and key features of a particular product in a standardized, defined manner.

This DCS defines the DICOM capabilities and key features of Philips Medical Systems' HD11 ultrasound imaging system.

For a hospital's Information Technology (IT) department, matching DICOM Conformance Statements between vendor product offerings is a key element to determine interconnectivity between vendors' devices.

This Conformance Statement should be read in conjunction with the DICOM standard and its addenda [DICOM].

0.2 Intended Audience

Context: Expansion of Headings and sub-headings

- Introduction
  - Intended Audience

This Conformance Statement is intended for:

- Potential customers
- System integrators of medical equipment
- Marketing staff interested in system functionality
- Software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

0.3 Overview of DICOM product offering

Context: Expansion of Headings and sub-headings

- Introduction
  - Overview of DICOM product offering

HD11 is an ultrasound system. The services supported by HD11's DICOM subsystem are derived from the following customer needs:

Name	**Customer Need**	**Options package**
Optioning	Ability to purchase some features and not others.	N/A
Archival	Archival of digital images to: 1. Removable media or 2. Across the network	1. DICOM Media 2. DICOM Networking
Printing of medical images	Printing to a DICOM compatible printer.	DICOM Networking
Verification	Ability to verify the existence of and communicate with a DICOM server on the network.	DICOM Networking
Modality WorkList (MWL)	Ability to obtain lists of patients and procedures from the hospital's information system.	DICOM Networking
Modality Performed Procedure Step (MPPS)	Ability to update the information in the hospital's information system with regard to the status of a scheduled procedure.	DICOM Networking
DICOM SR	Archival of structured report (for obstetric, gynecology and cardiac studies) to: 1. Removable media or 2. Across the network	DICOM Structured Reporting

The base HD11 system will be sold with no DICOM services enabled. Customers requiring functionality beyond that provided by the base system purchase DICOM services as options on top of the base system.

Philips Medical Systems offers customers three DICOM options:

1.	DICOM Media	Capability to read/write studies from/to a CD-R, CD-RW or MOD. This is enabled/disabled via hardware: based on the presence or absence of the MOD drive.
2.	DICOM Networking	Capability to store studies across a network, transfer ownership of studies to the PACS and print a hardcopy to a DICOM printer. Capability to request lists of scheduled work from the hospital's information system and the ability to update study status information in the hospital's information system. Enabled via access codes.
3	DICOM Structured Reporting	Capability to generate and store structured report for obstetric, gynecology and cardiac studies to DICOM formatted media and across the network.

Note: DICOM Networking encompasses what in EnVisor had been two separate options: DICOM Basic and DICOM Advanced.

While the DICOM Conformance Statement is not intended to be a complete HD11 product specification, some areas of this document will refer to system operation where it is necessary to add a context for the discussion or to help explain a capability.

0.4 Sources for this Document

Context: Expansion of Headings and sub-headings

- Introduction
  - Sources for this Document

The source for this document is:

- American College of Radiology-National Electrical Manufacturers Association (ACR-NEMA) Digital Imaging and Communications in Medicine (DICOM) documents PS 3.1-2004 through PS 3.18-2004.

0.5 Important Note to the Reader

Context: Expansion of Headings and sub-headings

- Introduction
  - Important Note to the Reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

Interoperability

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment. It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

Validation

Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

New versions of the DICOM Standard

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

0.6 Acronyms, Abbreviations and Glossary of Terms

Context: Expansion of Headings and sub-headings

- Introduction
  - Acronyms, Abbreviations and Glossary of Terms

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA PS 3.3 and PS 3.4.

ACC ----------American College of Cardiology

ACR----------American College of Radiology
Initiated the DICOM standardization effort in the early 1980's.

AE ----------Application Entity
A software process that implements DICOM. HD11 uses a single AE.

AE Title----------AE's require a unique 'AE Title', typically set up during installation through HD11's setup key on the control panel. Application Entities (AE's) identify themselves to each other via the AE Title at application level.

ANSI ----------American National Standard Institute

ASE ----------American Society of Echocardiography

Association ----------A connection between AE's for DICOM exchange.

ASCII----------American Standard Code for Information Exchange
Known for standardizing codes for text.

Attribute ----------Attributes are the components of an object (IOD), describing its properties. Examples of attributes are Patient Name, Patient ID etc. Each attribute has a unique DICOM tag.

Big Endian ----------An encoding method for storing the most significant Byte in the high order bits of a 16 bit word. Motorola based CPU's expect information to be stored this way. Exchanged as part of the transfer syntax. Conversion to

little endian would require swapping each byte within the words.

CD-R ----------Compact Disk, Write once, read many times.
An option for the physical specification for the DICOM media exchange standard and used by HD11 as a removable media device.

CD-RW ----------Compact Disk, multi-write, multi-read
An option for the physical specification for the DICOM media exchange standard and used by HD11 as a removable media device.

DICOM----------Digital Imaging and Communications In Medicine
Version 3.0 is the current defined version and is that used by this in this document.

DICOM Media ----------A DICOM option that can be purchased by the customer, it allows the user to write DICOM studies to removable media.

DICOM Networking------A DICOM option that can be purchased by the customer, it allows the user to perform network export of DICOM studies and DICOM print as well as to select a procedure from a Modality Worklist and to send study status information to the department scheduler. It includes DICOM Media.

DICOM SR----------A standard for documents that incorporates references to images and associated data. Each DICOM Structured Report encodes only what is meant, not how it is intended to be displayed, printed or otherwise presented.

DICOM Structured Reporting – A DICOM option that can be purchased by the customer, it allows the user to generate and store structured report for Obstetrics, Gynecology and cardiac studies to a DICOM formatted media and across the network.

DICOMDIR----------The standard directory structure specified for DICOM media exchange.

DIMSE ----------DICOM Message Service Element.
The DICOM set of commands (e.g. C_ECHO, C_STORE, etc.)

HD11 ----------Philips Medical Systems' HD11 ultrasound system.

Explicit VR ----------Explicit Value Representation
A transfer syntax which is negotiated by which the receiver is explicitly told the VR syntax and context. This is in contrast to Implicit VR.

FSC----------File-set creator
The function of a device that creates DICOM exchange media, typically an acquisition device such as an ultrasound. HD11 is a FSC.

FSR ----------File-set reader
The function of a device that reads DICOM exchange media - typically a viewing station. HD11 is also a FSR and can view studies created by other HD11 systems.

FSU----------File-set updater
The function of a device that can read DICOM exchange media and update the DICOMDIR.

Implementation Class UID A unique number, which is exchanged during the set up of the association, by which HD11 identifies itself. This UID is guaranteed not to change for a specific release of HD11.

Implicit VR ----------Implicit Value Representation
A transfer syntax which is negotiated by which the receiver is assumed to know the VR syntax and context.

HIS ----------Hospital Information System

IOD ----------Information Object Definition
Specification of a DICOM object such as a US Image Object.

ISO ----------International Standards Organization

JPEG ----------An image compression technique created by the Joint Photographic Experts Group

Little Endian ----------An encoding method by which the least significant byte is stored in the high order bits in a 16 bit word. This is how Intel based CPU's store data.

LUT ----------Look Up Table
Specifying mapping from specific values such as pixel values into luminance.

MOD----------Magneto Optical Disk
Used by HD11 as one of the physical exchange media options for the DICOM exchange standard.

Modality ----------An acquisition system such as CT, MR, US. HD11 is an ultrasound (US) modality.

Module ----------A group of attributes, specified as a unit for convenience reasons.
Examples are Patient module, Study module etc.

Monochrome2 ----------A color format for images in which the pixel values are grayscale values with a range of 0-255, 0 represents a Black pixel and 255 represents a White pixel.

MPPS----------Modality Performed Procedure Step
Used by HD11 for informing a department scheduler of the status of a study.

MWL ----------Modality WorkList
Used to provide on the HD11 system a Worklist of scheduled procedures.

NEMA ----------National Electrical Manufacturers Association
US trade organization, members of which defined the first version of the DICOM standard together with the ACR.

PACS----------Picture Archiving and Communications System
An image archive.

PaletteColor----------A color format for images in which the pixel values are indices into a color table. See RGB and YBR for other color formats.

PDU----------Protocol Data Unit
Packet that is created at the DICOM lower-level protocol.

Pixel----------Smallest, single element or dot of an image.

QLAB----------A Philips tool for advanced quantification of images.

RGB----------A color format for images in which the pixel values contain the red, green and blue color intensities. See PaletteColor and YBR for other color formats.

RIS----------Radiology Information System
Which typically schedules and maintains patient demographic information.

RLE ----------Run Length Encoding
A lossless image compression scheme.

SCP----------Service Class Provider
DICOM AE that functions as a server or 'provides' a service such as Storage, Print etc.

SCU ----------Service Class User
DICOM AE that functions as a client, or uses a service, i.e. for printing, storage etc.

Service Class ----------A service class is a group of one or more SOP classes e.g. the Storage Service class contains all the storage SOP classes (CT_STORE, US_STORE etc).

SOP ----------Service Object Pair
Combination of a service such as US_STORE and an object such as image.

SR---------- Structured Report

TCP/IP ----------Transmission Control Protocol/Internet Protocol
The communication standard supported by DICOM.

Transfer Syntax ----------Encoding specification of DICOM messages, negotiated while setting up an association. Examples of different transfer syntaxes are Little Endian or Big Endian, Implicit or Explicit VR, or a compression scheme (such as RLE or JPEG).

Type----------Specification of rule for whether an attribute has to be present in an object. Type 1 attributes are required; Type 2 are required but can be left blank when unknown; Type 3 are optional.

U/U----------Usage specification for a specific service, meaning (user-) optional for SCU and mandatory for SCP.

U/M ----------Usage specification for a specific service, meaning (user-) optional for both SCU and SCP.

UID----------Unique Identifier
A world-wide unique numbering scheme which is used by

the NEMA to, for example, identify SOP classes, syntaxes etc and vendors for identifying SOP instances.

US ----------Ultrasound

VM----------Value Multiplicity
Defining whether or not an attribute can have multiple elements, for example multiple phone numbers.

VR ----------Value Representation
The definition of rules and encoding of groups of similar attributes. For example the VR Person Name (PN) specifies exactly the sequence of last name, first name etc.

YBR ----------A color format for images in which the pixel values contain one luminance and two chrominance planes. See PaletteColor and RGB for other color formats.

1. **Implementation Model**

Context: Expansion of Headings and sub-headings

- Implementation Model

This section describes the functional relationship between the device and the DICOM services:

Customer Need	**Provided in options package**	**Functionality**	**DICOM Service Classes Required**
Optioning	Bundled	Ability to install/remove optional features	
Archive to Media	Bundled	Saving BMP's, AVI's, and HTML docs to media	
		Formatting removable media: MOD.	
	DICOM Media	Saving DICOM studies to removable media.	Media Storage Service Class – File Set Creator
			Media Storage Service Class – File Set Updater
Retrieval from Media	DICOM Media	Reading DICOM studies from removable media	Media Storage Service Class – File Set Reader
Archive to Network	DICOM Networking	Network export of DICOM images	Storage SCU
		Transfer ownership of acquired images to a PACS.	Storage Commitment SCU

Customer Need	Provided in options package	Functionality	DICOM Service Classes Required
Print	Bundled	Print images to PC based printers, non-DICOM film printers.	
	DICOM Networking	Print studies to a DICOM printer – both color and B&W.	Print Management SCU
Modality Worklist (MWL)	DICOM Networking	Request modality worklists from the Modality Worklist Server.	MWL SCU
Modality Performed Procedure Step (MPPS)	DICOM Networking	Inform the hospital of the status of a performed procedure.	MPPS SCU
DICOM SR	DICOM Structured Reporting	Network/media export of DICOM structured report files for Obstetrics, Gynecology and Cardiac studies.	SR Storage SCU
		Transfer ownership of generated DICOM SR files to a PACS.	SR Storage Commitment SCU
Setup	DICOM Networking	Verification that a network device is a DICOM server.	Verification SCU
		Response to requests from the network to verify that HD11 is a DICOM device.	Verification SCP

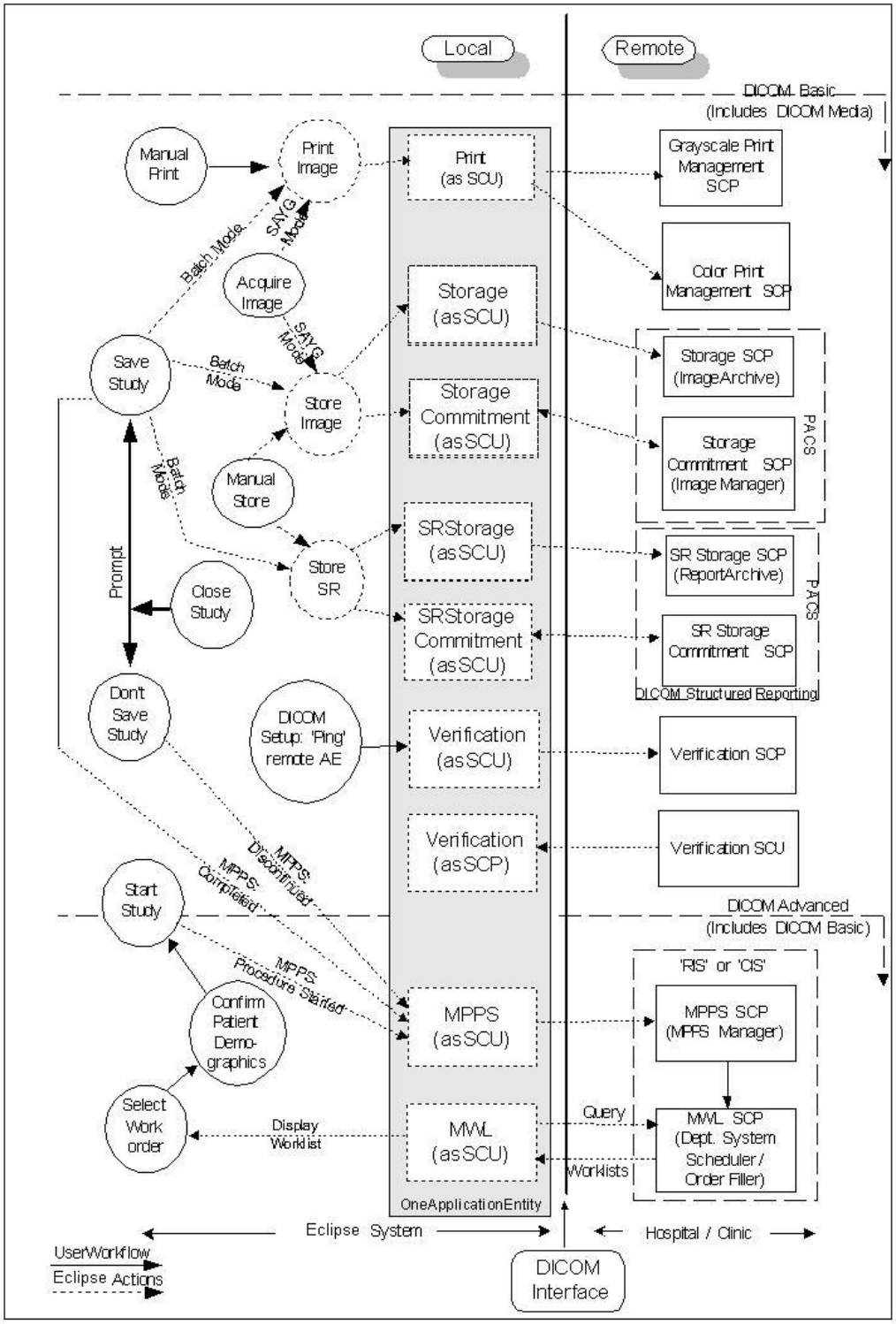
Customer Need	Provided in options package	Functionality	DICOM Service Classes Required
		Set the AE Title for HD11; Specify which network server is the primary and secondary storage SCP, storage commit SCP; List servers, add servers etc	

1.1 Application Data Flow Diagrams

1.1.1 Network Relationships

The diagram in Figure 1.1-1 represents the relationship between HD11's Application Entity and it's use of DICOM to real-world activities. Figure 1.1-1 shows the relationships for DICOM activities on the network.

Figure 1.1-1 Network Relationships



The left side of the diagram (labeled 'Local') represents the HD11 system being described in this DICOM Conformance Statement. The right side (labeled 'Remote') represents equipment that HD11 is meant to exchange information with (the Hospital/Clinic), and the vertical line in between is the DICOM Interface.

The long rectangular gray box represents the one and only Application Entity that is used in the implementation of all HD11's DICOM services. This single AE supports all the HD11 services: print, storage, storage commitment, verification, MWL and MPPS.

Since an AE must have a unique AE Title across a hospitals network (HIS), the user can configure the AE's title through setup. The dotted rectangular boxes within the Application Entity represent the various DICOM services used (SCU) and supported (SCP).

The circles, on the left side of the diagram, represent real-world activities that a user can perform with the HD11 system, such as saving a study and acquiring an image.

The diagram shows that HD11 supports storing images to a remote PACS, as well as transferring ownership of the images to a PACS so that the study can automatically be deleted from HD11's hard-drive.

Images can be:

1. Sent to the primary (and if configured secondary) Storage SCP as soon as they are acquired (circle 'Acquire Image'), this is called send-as-you-go mode.
2. Batched up and sent all at once each time the study is saved (circle 'Save Study').
3. A study can be selected, by the user, from a list of studies on HD11's local hard-drive, and manually exported (circle 'Manual Store').

The diagram shows that HD11 supports storage and store commitment of structured report (SR) to a remote PACS. HD11 allows the user to configure Image archival SCP and SR archival SCP as different AEs, however this is not a restriction and the user can use same SCP for both. It is to be noted that SR is exported only for obstetric, gynecology and cardiac type studies.

SRs can be:

1. Sent to the SR Storage SCP whenever a study is closed (Batch Mode as well as Send As You Go mode)
2. Sent to the SR Storage SCP by the user using manual export.

HD11 also supports printing studies to a grayscale or color DICOM printer. As with storing studies to a remote PACS, images can be printed as soon as they are acquired (but only when there are enough to fill a page); they can be batched for printing all at once when the study is saved, or the study can be selected manually for printing.

If color images are sent to a grayscale printer, they will be converted to grayscale. If both a color and grayscale printer is configured, color images will be routed to the color printer and grayscale images will be routed to the grayscale printer.

HD11 supports Modality Worklists (MWL) and Modality Performed Procedure Step (MPPS.) These two capabilities work together to allow HD11 to communicate with a Hospital Information System (HIS) to obtain and display lists of patients scheduled for imaging procedures and to update the HIS whenever the status of a scheduled procedure changes (for example, when a scheduled study is completed.)

The diagram shows that when a study is started (circle 'Start Study'), HD11 sends an MPPS Study Started message to the department system scheduler (MPPS SCP) and when the user finishes the study a MPPS Study Completed message is sent to the department system scheduler (circle 'Save Study'). It also shows that the user can discontinue a study (circle 'Don't Save Study'), in which case a MPPS Study Discontinued message is sent to the department system scheduler.

The user can disconnect the network cable and use HD11 in walk-about or portable mode. When reconnected to the network, HD11 will process any queued jobs including storage, printing and Storage Commitment. Queued MPPS status updates will also be performed. Also, on reconnect, HD11 resumes the periodic retrieval of the modality worklist.

1.1.2 Removable Media Relationships

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Application Data Flow Diagrams
    - Removable Media Relationships

The diagram in Figure 1.1-2 represents the relationship between HD11's Application Entity and it's use of DICOM to real-world activities. Figure 1.1-2 shows the relationships for DICOM activities involving local storage to removable media.

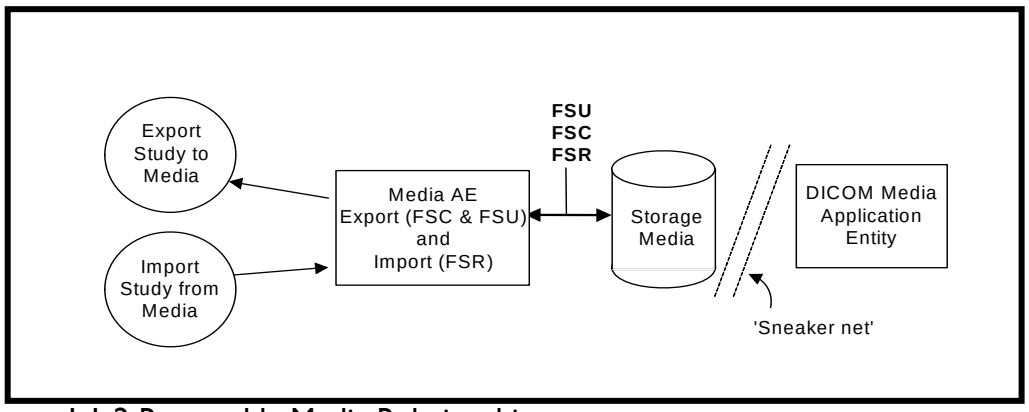


Figure 1.1-2 Removable Media Relationships

As with the previous diagram, circles represent real-world activities performed on the HD11 system.

The diagram shows that HD11 supports the writing of DICOM studies to the ultrasound systems removable media (CD-R, CD-RW or MOD). Writing of a DICOM study includes writing of images by default. DICOM SR files of obstetrics, gynecology and cardiac study types are written in case the package DICOM Structured Reporting is purchased. This is useful for exporting the studies to the image / report archive when the hospitals network is down. It is also useful for long term archival to CD of studies for sites that have not purchased the networking capability provided in the 'Networking' package.

HD11 can also read back into the system studies that it (another HD11 system or an EnVisor system) has previously written to removable media. However, since HD11 is

not an image archive but an image modality, it will not allow a user to read studies into the system that were not generated by an HD11 (or EnVisor) system. HD11, when it reads back a study from media, does not read back SR.

The rationale behind allowing HD11 to read studies generated by an EnVisor system is that HD11 is a potential 'next' purchase for EnVisor customers. It is an upgrade and therefore the customer would want to be able to read studies that they generated with the EnVisor. However, the opposite is not true – an EnVisor system will not be able to read studies generated by an HD11 system.

1.2 Functional Definition of HD11 AE

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE

HD11 is implemented as a single AE. The DICOM AE Title and Port number are configurable by the user through the 'Setup' screens. The default AE Title that HD11 will use is the host name of the computer. Since AE Titles must be unique across a hospital's network and computer names must also be unique, some institutions institute a policy where the AE Title is derived from the computer name. HD11 supports this by allowing the user to specify a fixed string for a prefix and suffix. The AE Title is then generated from the prefix, the computer's name and the suffix.

The default port number is 104 but as with the AE Title, the port number can be configured by the user.

There are ten real-world activities that the HD11 AE performs. These are:

1. Storage of DICOM studies (Images and SRs) to a PACS,
2. Issuing of Storage Commitment requests to a PACS,
3. Verification of the existence of DICOM servers on the hospital's network,
4. Printing DICOM studies to a B&W or color printer,
5. Responding to a verification request from a remote DICOM server,
6. Saving a DICOM study to removable media,
7. Reading a DICOM study from removable media,
8. Writing and Reading a study to/from removable media in Non-DICOM formats
9. Obtaining a list of scheduled work from the HIS via the MWL Server, and

10. Updating the HIS whenever a scheduled procedure changes using the MPPS Server.

These real-world activities are described, in general terms, in the following sub-sections.

1.2.1 Storage of DICOM studies (Images and SRs) to a PACS

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Storage of DICOM studies to a PACS

HD11 acts as a Service Class User (SCU) of the 'Ultrasound Image Store', 'Ultrasound Multiframe Image Store' and 'Comprehensive SR' SOP Classes using DIMSE C-STORE commands to transmit images and SRs to the storage server. It provides a set of DICOM configuration settings used to set up the network interface and storage options. The configurable options include specification of the DICOM storage server (host-name, port number and AE Title) for both image storage and SR storage. These options can be accessed through the DICOM Setup screen.

Just before the first image is sent from the system, the storage AE establishes an association with the primary (and if configured secondary) storage SCP and maintains the open association as long as images for storage are in the queue to that SCP. If the queue empties, the storage AE will close the association. This process will repeat for subsequent images. Therefore, images sent quickly one after the other would share the same association. This reduces overhead and improves performance. Therefore

- In Batch Mode, where all the images (since last save) are sent to the storage SCP when the user closes the study (and confirms export) - all the images will be sent on the same association.
- In Batch Mode, where the user presses the save icon (floppy disk) in review mode, the images acquired since the last save are sent to the storage SCP - all the images will be sent on the same association.
- In send-as-you-go mode, where the images are sent one-at-a-time as the user acquires them - each image will be sent on a separate association.

SR document is generated only when a study is closed. Hence in batch mode or in send as you go mode SR is exported to the SR storage server only when the study is closed. Similar to the image storage, an association is opened with SR storage server and all the SRs associated with the study are sent to the SCP before closing the association.

If any images (or SRs, if applicable) in a study are not successfully stored to the Storage SCP (or SR Storage SCP), then the study is marked with an icon indicating failure in the 'Search for Study' screen. If the user subsequently manually exports the study, all the images (and SRs, if applicable) will be resent to the Primary Storage SCP and (if defined) the Secondary Storage SCP. As mentioned, all images will be sent - both those that were previously successfully stored and those that failed. The Storage SCP will detect, without detrimental consequences (per the DICOM standard), that some images are duplicates.

A.2.1.1 Monochromization and Intelli-Store

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Storage of DICOM studies to a PACS
      - Monochromization and Intelli-Store

HD11 allows the user to select photometric interpretation and transfer syntax of the image pixel data so that HD11's images can be viewed with a wide range of DICOM viewers. HD11 supports RGB, PALETTE_COLOR, MONOCHROME2 and YBR_FULL_422 photometric interpretations. If MONOCHROME2 is selected, the color images are monochromized (converted to 8 bit grayscale) before transfer to PACS.

Intelli-store feature of HD11 allows the user to send Black & White images in monochrome format and color images in a different format (e.g. RGB or YBR)

1.2.2 Issuing of Storage Commitment requests to a PACS

1.2.2.1 Batch Mode and Manual Export

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Issuing of Storage Commitment requests to a PACS
      - Batch Mode and Manual Export

If the user has configured, through DICOM setup, a Storage Commitment server, then after the last image of the study is stored to the Primary storage SCP, HD11 will generate an N-Action to request Storage Commitment by the Storage Commitment SCP of all the images. Storage Commitment will not be requested unless all the images of the study have been successfully sent to Primary Storage SCP.

The N-Action command contains a list of image Instance UIDs. After the Storage Commitment SCP sends the N-ACTION-RSP, HD11 immediately closes the association without waiting for the N-EVENT-REPORT from the Storage Commitment SCP.

Some time later, the Storage Commitment SCP will open an association with HD11's AE using reverse-role negotiation, and will send an N-Event Report with a list of the image Instance UIDs that were successfully committed and if applicable, a list of those that were not. If the list contains images that could not be committed, HD11 marks the complete store job as 'FAILED' and retry of job will involve requesting Store and Store commit for all the images in the study, including the ones that had been successfully committed.

HD11 will reject an association requested by a Storage Commitment SCP that does not employ role-reversal.

Issuing of Storage Commitment request and the processing of the response from the commitment SCP for SR works in the same way as images. If a storage commitment SCP has been configured for SR, HD11 will generate an N-ACTION request for storage commitment of all the SR instances that were stored.

1.2.2.2 Send-As-You-Go Mode

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Issuing of Storage Commitment requests to a PACS
      - Send-As-You-Go Mode

If the user has configured, through DICOM setup, a Storage Commitment server, then after each image of the study is successfully stored to the Primary storage SCP, HD11 will generate an N-Action to request Storage Commitment of the image by the Storage Commitment SCP.

Therefore, in send-as-you-go mode, where the images are sent one-at-a-time as the user acquires them, multiple N-Action requests are generated and sent to Storage Commitment SCP. One N-Action request corresponds to one image.

The N-Action command contains the transaction UID of the just acquired image. HD11 then, as with batch mode, closes the association and waits for a reply from the STORAGE COMMITMENT server.

1.2.3 Verification of the existence of DICOM server on the hospitals network

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Verification of the existence of DICOM server on the hospitals network

When the user configures one of the SCP servers (for example the Primary Storage SCP or B&W printer SCP), he/she can optionally 'ping' the SCP to verify it is a DICOM server, it is on-line and it is enabled to communicate with this HD11 system.

When the user requests a 'DICOM Ping', the verification SCU will initiate an association with the remote server and send a C-Echo request to the server.

1.2.4 Printing DICOM studies to a B&W or color printer

HD11 serves as a print SCU and sends images to a remote DICOM print device.

1.2.4.1 Monochromization and Intelli-print

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Printing DICOM studies to a B&W or color printer
      - Monochromization and intelli-print

The operator can configure up to two print SCPs: one B&W and one COLOR. If only a B&W print SCP is configured, then color images will be converted to grayscale. If both B&W and color print SCP's are defined then HD11 uses an "intelli-print" process to send color images to the color SCP and grayscale images to the B&W SCP.

If both a color and BW printer are configured, HD11 creates two separate requests for printing, one for the color images in the study and the other for the gray images. These two requests lead to two separate Print Jobs, and since, HD11 executes only one print job at a time, these jobs would be executed sequentially.

1.2.4.2 Batch Mode and Manual Print

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Printing DICOM studies to a B&W or color printer
      - Batch Mode and Manual Print

In Batch Mode, where all the images are printed when the user closes the study, all the images will be sent on the same association. Each page will contain the configured number of images. The last page may be a partial page if there are not enough images to fill the page; this ensures that a printed page cannot have images from multiple studies

1.2.4.3 Send-As-You-Go Mode

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Printing DICOM studies to a B&W or color printer
      - Send-As-You-Go Mode

In send-as-you-go mode, as images are acquired they are held until a full page of images is ready for printing. When a full page of images is ready for printing, HD11 will open an association with the printer, send the images and then close the association.

When the study is closed, any partially filled page is printed. As with Batch Mode, this ensures that a printed page cannot have images from multiple studies

1.2.5 Responding to a verification request from a remote DICOM server

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Responding to a verification request from a remote DICOM server

The ultrasound system employs a Verification SCP to reply to verification requests sent by remote devices. This will allow the remote device to ensure the availability of HD11 on the network, within the constraints of the network topology, and timeout values.

HD11 employs a 'high security' paradigm for responding to verification requests by remote devices. This means, HD11 will only respond to C-Echo requests from DICOM Servers that it knows about. Specifically, the following steps must have been performed:

1. In DICOM Setup, add the DICOM server to the list of DICOM servers.
2. Assign the server to the appropriate role.
3. Reboot the system.

Note: Philips considers step 3 (the reboot) a limitation that may be removed in some future release.

1.2.6 Saving a DICOM study to removable media

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Saving a DICOM study to removable media

HD11 is a DICOM file set creator (FSC) and updater (FSU). Studies can be saved (exported) to HD11's removable media (CD-R, CD-RW or MOD), in DICOM format, for long-term storage. Also, if a customer chooses not to purchase DICOM Networking, then DICOM media can be used as a 'sneaker-net' to get DICOM studies off HD11 and onto the PACS.

1.2.7 Reading a DICOM study from removable media

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Reading a DICOM study from removable media

HD11 is a DICOM file set reader (FSR). Studies that HD11 has saved to removable media may also be loaded into another HD11 system or even into the same HD11 system (as long as the original study has already been deleted). Since HD11 is not an image review station, it will check the originator of the study and only import studies created by another HD11 or an EnVisor system.

Even though HD11 supports writing of SRs to the media, read back of SR is not supported.

1.2.8 Writing and Reading a study to/from removable media in Non-DICOM formats

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Writing and Reading a study to/from removable media in Non-DICOM formats

Users that do not purchase DICOM Media can write the images in DICOM studies to removable media as bmp's and AVI's. Images written in this format cannot be read back into the system.

They can also write a study to removable media in an HD11 proprietary format that includes patient demographic information and can be read back into (the same) or another HD11 system. This format, however, is not DICOM and cannot be read by non-HD11 systems. EnVisor also allowed the user to write a study to removable media in an EnVisor proprietary format that includes patient demographic information. HD11 will be able to read studies generated in the EnVisor proprietary format.

1.2.9 Obtaining a list of scheduled work from the HIS via the MWL Server

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Obtaining a list of scheduled work from the HIS via the MWL Server

HD11 acts as a Service Class User (SCU) of the 'Modality Worklist (MWL)' SOP Class using DIMSE C-FIND commands to retrieve lists of scheduled protocols (imaging sessions) from the HIS.

A set of standard MWL queries is available (e.g. Show today's worklist entries, show today's worklist entries assigned to this system, show yesterday, today and tomorrow's worklist entries etc.). The user can also configure their own queries based on start date, AE Title of performing HD11 etc.

The current work lists can be retrieved manually (when the HD11 system is connected to the network) or automatically polled in the background.

1.2.10 Updating the status of a scheduled procedure using the MPPS Server

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Functional Definition of HD11 AE
    - Updating the status of a scheduled procedure using the MPPS Server

HD11 also acts as a Service Class User (SCU) of the 'Modality Performed Procedure Step (MPPS)' SOP Class.

The start procedure message (N-CREATE) is sent when the user presses the OK button on the Patient ID Window to bring up live imaging. The MPPS Server is also notified, with a N-SET command, when the study is completed (when the study is saved to HD11's disk and closed), or when it is discontinued (when the study is closed without saving.)

1.3 Sequencing of Real-World Activities

Context: Expansion of Headings and sub-headings

- Implementation Model
  - Sequencing of Real-World Activities

For printing and storing using the Print Gray Image, Print Color Image, and Store Image commands, the user must have previously completed the Patient ID screen (which creates a study). For accessing and updating procedures scheduled by the HIS, the HD11 user must first select a patient from the Patient Selection screen which displays a list of patients scheduled for procedures on HD11.

2. Application Entity Specifications

HD11 is implemented as a single AE.

2.1 HD11 AE Specification

2.1.1 Association Establishment Policies

2.1.1.1 General

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Establishment Policies
      - General

The following Application Context Name will be proposed and recognized by HD11:

- DICOM 3.0 Application Context **1.2.840.10008.3.1.1.1**

The PDU size is configurable with a minimum size of 100 and a maximum size of 16,000. The default PDU size is 16,000.

2.1.1.2 Number of Associations

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Establishment Policies
      - Number of Associations

HD11 **establishes** one association per destination at a time. The total number of associations possible at one time is 9: one B&W printer, one Color printer, one Primary Storage Server, one Secondary Storage Serer, one Storage Commitment server, one SR storage server, one SR commitment server, one MWL server and one MPPS server.

HD11 accepts simultaneous associations for Storage Commitment and Verification. If multiple servers issue a Storage Commitment or verification request at the same time, HD11 will accept all the associations. The maximum number of simultaneous associations **accepted** by HD11 is limited only by resource constraints.

2.1.1.3 Asynchronous Nature

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Establishment Policies
      - Asynchronous Nature

HD11 allows a single outstanding operation on any association. Therefore, HD11 does not support asynchronous operations window negotiation, other than Storage Commitment reverse-role negotiation for N-Event Report's.

2.1.1.4 Implementation Identifying Information

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Establishment Policies
      - Implementation Identifying Information

Element	Implementation Value
Implementation Class UID	1.2.840.113543.6.6.4.1
Implementation Version Name	HD11_V1.1

Table 4: Implementation Identifying Information

Note: This Class UID and Version Name will be used for the release of HD11 described in this DICOM Conformance Statement. The Class UID and Version Name may be updated with subsequent HD11 releases to capture the version level of the new release, however the Implementation Version Name for the HD11 product will always start with the characters "HD11" and the Implementation Class UID will always be of the form 1.2.840.113543.6.6.4.n

2.1.2 Association Initiation by Real-World Activity

2.1.2.1 Storage of DICOM studies to a PACS

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS

The HD11 provides standard conformance to the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID	Role
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	SCU
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	SCU
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	SCU

Table 5: SOP Classes Supported by Network Storage AE

2.1.2.1.1 Associated Real-World activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Associated Real-World activity

Note: In the following sections if a study has SR (obstetric, gynecology or cardiac), association is initiated with the SR storage server. Even if the image storage server and SR storage server are same, association used for SR(s) export is different from the association used for image export.

Unless stated otherwise, the following description applies to both image and SR storage.

The real world activities that will trigger HD11 to initiate an association with the Primary and, if configured, the Secondary Storage Server is dependent on the mode of operation:

1. **In Manual mode**

   An association is initiated when the user selects a study from the list of studies on HD11's local hard-drive and requests that the selected study be exported to the PACS.

2. **In Send-As-You-Go mode**

   An association is initiated when the first image is acquired. HD11 will close the association after the image has been stored. A new association will be initiated when the next image is acquired. If Send-As-You-Go mode is configured, SR is always exported when a study is closed.

3. **In Batch mode**

   An association is initiated whenever the user saves the study. The images that have been acquired since the previous 'save' are stored to the PACS. To enhance network performance images / SRs that have already been stored to the PACS are not resent. A new version of SR is generated containing only the new analysis data for the study (if any). This version is exported when the study is closed.

Store Association Negotiation - Association Status (Send-As-You-Go mode)

User Action	**DICOM Activity – Store Send As You Go Mode**
Acquires Image from system	Association Negotiation, then C-Store for the acquired image, then Association Release Request is sent.

Store Association Negotiation - Association Status (Batch Mode & Manual Mode)

User Action	**DICOM Activity – Store**
Save Study	Association Negotiation then C-Store until all images sent, then Association Release Request is sent.
Close Study	Association negotiation with SR storage server then C-Store until all SRs sent then association release request is sent.

The user can also configure the photometric interpretation and transfer syntax of the image pixel data so that HD11's images can be viewed with a wide range of DICOM viewers.

For an export to the PACS the user can specify different image formats for the Primary and Secondary Storage SCP. The user can choose from one of the following image formats:

- Palette Color, RLE Compressed
- Palette Color, Uncompressed (Implicit VR, Little Endian)
- Palette Color, Uncompressed (Explicit VR, Little Endian)
- RGB, RLE Compressed
- RGB, Uncompressed (Implicit VR, Little Endian)
- RGB, Uncompressed (Explicit VR, Little Endian)
- YBR FULL 422, JPEG compressed.
- Monochrome2, RLE Compressed
- Monochrome2, Uncompressed (Implicit VR, Little Endian)

- Monochrome2, Uncompressed (Explicit VR, Little Endian)

It is possible for a user to configure the image format such that Black & White images are always sent using Monochrome2 format while color images are sent in a different format (as per user's selection). This feature is referred to as intelli-store.

Notes:

Palette Color – Pixels are indices into a palette

RGB - pixels are intensities of Red, Green and Blue color components

YBR FULL 422 - pixels are described by one luminance and two chrominance planes, sampled with twice as a much luminance as chrominance

Monochrome2 – pixels are grayscale values with a range of 0-255, 0 represents a Black pixel and 255 represents a White pixel.

HD11 will try to negotiate the transfer using the appropriate transfer syntax as per the user selected image format. The Image transfer could fail if the storage SCP does not support the transfer syntax. In this case HD11 will report an error condition to the user in the 'Search for Studies' screen. Therefore, as a network administrator you should not configure HD11 to send the images in formats not supported by your image archive.

For manual export to removable media the user has the same choices of image format as supported in network export. The intelli-store feature is also available for export to removable media.

Table 6 describes the behavior of the Network Storage AE in response to various error conditions and C-STORE-RSP status indicators. This description is applicable for image as well as SR storage.

Establishing the association

Condition (After C-Store)	**Status Codes** (C-Store-RSP)	**Response**
Could not establish the association within 30-second time window (Connect Timeout) due to NO RESPONSE from the Storage Server	Not Applicable	The association attempt is aborted, and after 5-minutes a new association is attempted. HD11 will make three attempts to open an association with the configured Storage SCP before aborting the storage request and placing the job in an error state. The user can then manually restart the job at some later date. The failure is logged to the DICOM log file as an error. The 5-minute timeout and the number of retries are configurable by the user from the DICOM Setup screens. The 5-minute timeout is mapped to the 'Retry Interval' input control on the 'DICOM Setup screen and the number of retries is mapped to 'Maximum Retries' on the DICOM Setup screen.
Refused	A7xx	If the Storage SCP server refuses the association, then the association attempt is aborted. HD11 will wait 5-minutes and then reattempt the association. HD11 will make three attempts to establish the association before aborting the storage request and placing the job in an error state. The user can then manually restart the job at some later date. The failure is logged to the DICOM log file as an error. As an example, the association would be refused if the storage server employs a high security mechanism whereby it only accepts association requests from DICOM Servers that it knows about and the HD11's AE Title was not in the PACS database. The 5-minute timeout and the number of retries are configurable by the user from the DICOM Setup screens. The 5-minute timeout is mapped to the ''Retry Interval' input control on the DICOM Setup screen and the retry is

Condition (After C-Store)	**Status Codes** (C-Store-RSP)	**Response**
		mapped to 'Maximum Retries' on the DICOM Setup Screen.

During image transfer

Condition (After C-Store)	**Status Codes** (C-Store-RSP)	**Response**
After association has been accepted, there is no response to a request within 5-minute time window (Read Timeout).	Not Applicable	If the association is lost during active image transfer to the Storage SCP server, HD11 will initiate a new association after 5 minutes, and attempt to store all the images. If during transfer, the association is again lost, HD11 will wait another 5 minutes and try again. HD11 will make three attempts to send all the images before aborting the storage request and placing the job in an error state. The user can then manually restart the job at some later date. The failure is logged to the DICOM log file as an error. The 5-minute timeout and the number of retries are configurable by the user from the DICOM Setup screens. The 5-minute timeout is mapped to the ''Retry Interval' input control on the DICOM Setup screen and the retry is mapped to 'Maximum Retries' on the DICOM Setup Screen.
Error	A9xx, Cxxx, 0122, Other	HD11 will treat all errors as failure of Storage request (also called as Job). A failed job is automatically retried after 5 minutes. If the job fails even after three attempts, HD11 will abort this request and place the job in an Error state. The user can then manually restart the job at some later date. The failure is logged to the DICOM log file as an error. The 5-minute timeout and the number of retries are configurable by the user from the DICOM Setup screens. The 5-minute timeout is mapped to the ''Retry Interval' input control on the DICOM Setup

Condition (After C-Store)	**Status Codes** (C-Store-RSP)	**Response**
		screen and the retry is mapped to 'Maximum Retries' on the DICOM Setup Screen.
Warning	D000, B000, B006, B007 0111	If the Storage SCP issues a warning on a particular image (perhaps it had to use coercion, HD11 logs the warning to the DICOM log file as an informational event and continues on as if the image was successfully stored to the PACS (see row below).
Success	0000	When an image is successful store to the Storage SCP (PACS), HD11 will keep a record of the successful storage. If all the images in the job are successfully stored, HD11 will notify the user (through an icon on the list of studies). And the job will be removed from the job manager.

Table 6: Responses to Image Storage Error Conditions

If more images of the same study are presented to the HD11 system, additional associations will be initiated to transfer the remaining images using the same Study and Series Instance UIDs.

2.1.2.1.2 Proposed Presentation Context

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context

Each time the Network Storage service initiates an association in response to the store request, it requests services summarized in Table 7.

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.6.1	JPEG baseline - Process 1 (Used if Image Format is YBR)	1.2.840.10008.1.2.4.50	SCU	None
		DICOM RLE Lossless (Used if Image format is 'Palette Color, RLE Compressed' or 'RGB, RLE Compressed' or 'Monochrome2, RLE Compressed'	1.2.840.10008.1.2.5		
		DICOM Implicit VR Little Endian (Used if Image format is 'Palette Color, Uncompressed ILE' or 'RGB, Uncompressed ILE' or 'Monochrome2, Uncompressed ILE')	1.2.840.10008.1.2		

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	**UID**	**Name List**	**UID List**		
		DICOM Explicit VR Little Endian (Used if Image format is 'Palette Color, Uncompressed ELE' or 'RGB, Uncompressed ELE' or 'Monochrome2, Uncompressed ELE')	1.2.840.10008.1.2.1		
Ultrasound Multi-frame Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.3.1	JPEG baseline – Process 1 (Used if Image Format is YBR)	1.2.840.10008.1.2.4.50	SCU	None
		DICOM RLE Lossless (Used if Image format is 'Palette Color, RLE Compressed' or 'RGB, RLE Compressed' or 'Monochrome2, RLE Compressed'	1.2.840.10008.1.2.5		
		DICOM Implicit VR Little Endian (Used if Image format is 'Palette Color, Uncompressed ILE' or 'RGB, Uncompressed ILE' or 'Monochrome2, Uncompressed ILE')	1.2.840.10008.1.2		

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
		DICOM Explicit VR Little Endian (Used if Image format is 'Palette Color, Uncompressed ELE' or 'RGB, Uncompressed ELE' or 'Monochrome2, Uncompressed ELE')	1.2.840.10008.1.2.1		
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 7: Transfer Syntaxes

The values of certain image attributes used in the transfer of each image depend on the Image Format as configured by the user in DICOM Setup (or specified during a manual export) as well as the type of image acquired.

The seven tables below, one for each image format, describe the relationships among these parameters.

1. Palette Color, RLE Compressed

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image[1]	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	8	600 (540 without top border)	800
2D color Image	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	600 (540 without top border)	800
2D B&W loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	8	600 (540 without top border)	800
2D color loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	16	600 (540 without top border)	800
Stress B&W 'quad' loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	8	245	320
Stress color 'quad' loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	16	245	320
Report	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	600	800

[1] 2D B&W Image include "Colorized" images, which map a sample to a color instead of a gray scale value.

3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	1024 (726 If from QLAB IMT plug-in)	1152

2. Palette Color, Uncompressed (Implicit VR, Little Endian)

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image[2]	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	8	600 (540 without top border)	800
2D color Image	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	600 (540 without top border)	800
2D B&W loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	8	600 (540 without top border)	800
2D color loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	16	600 (540 without top border)	800

[2] 2D B&W Image include "Colorized" images, which map a sample to a color instead of a gray scale value. p

Stress B&W 'quad' loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	8	245	320
Stress color 'quad' loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	16	245	320
Report	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	600	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	1024 (726 If from QLAB IMT plug-in)	1152

3. Palette Color, Uncompressed (Explicit VR, Little Endian)

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image[3]	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	8	600 (540 without top border)	800
2D color Image	Explicit VR Little	Ultrasound Image	PALETTE COLOR	1	16	600	800

[3] 2D B&W Image include "Colorized" images, which map a sample to a color instead of a gray scale value.

	Endian (1.2.840.10008.1.2.1)	Storage (1.2.840.10008.5.1.4.1.1.6.1)				(540 without top border)	
2D B&W loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	8	600 (540 without top border)	800
2D color loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	16	600 (540 without top border)	800
Stress B&W 'quad' loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	8	245	320
Stress color 'quad' loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	PALETTE COLOR	1	16	245	320
Report	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	600	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	PALETTE COLOR	1	16	1024 (726 If from QLAB IMT plug-in)	1152

4. RGB, RLE Compressed

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image[4]	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
2D color Image	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
2D B&W loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
2D color loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Stress B&W 'quad' loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	245	320
Stress color 'quad' loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	245	320
Report	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.	RGB	3	8	600 (540 without top	800

[4] 2D B&W Image include "Colorized" images, which map a sample to a color instead of a gray scale value.

		1.4.1.1.3.1)				border)	
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	1024 (726 If from QLAB IMT plug-in)	1152

5. RGB, Uncompressed (Implicit VR, Little Endian)

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image[5]	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
2D color Image	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
2D B&W loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
2D color loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Stress B&W 'quad' loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	245	320
Stress color 'quad' loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	245	320

[5] 2D B&W Image include "Colorized" images, which map a sample to a color instead of a gray scale value.

Report	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	1024 (726 If from QLAB IMT plug-in)	1152

6. RGB, Uncompressed (Explicit VR, Little Endian)

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image[6]	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
2D color Image	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
2D B&W loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800

[6] 2D B&W Image include "Colorized" images, which map a sample to a color instead of a gray scale value.

2D color loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Stress B&W 'quad' loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	245	320
Stress color 'quad' loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	245	320
Report	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	1024 (726 If from QLAB IMT plug-in)	1152

7. Monochrome2, RLE Compressed

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image	RLE Lossless (1.2.840.10008.1.	Ultrasound Image Storage	MONOCHROME2	1	8	600 (540	800

	2.5)	(1.2.840.10008.5.1.4.1.1.6.1)				without top border)	
2D color Image	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D B&W loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D color loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	600 (540 without top border)	800
Stress B&W 'quad' loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	245	320
Stress color 'quad' loop	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	245	320
Report	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	RLE Lossless (1.2.840.10008.1.2.5)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	1024 (726 If from QLAB IMT plug-in)	1152

8. Monochrome2, Uncompressed (Implicit VR, Little Endian)

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D color Image	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D B&W loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D color loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	600 (540 without top border)	800
Stress B&W 'quad' loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	245	320
Stress color 'quad' loop	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	245	320
Report	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800

Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	Implicit VR Little Endian (1.2.840.10008.1.2)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	1024 (726 If from QLAB IMT plug-in)	1152

9. Monochrome2, Uncompressed (Explicit VR, Little Endian)

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D color Image	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D B&W loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	600 (540 without top border)	800
2D color loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	600 (540 without top border)	800
Stress B&W 'quad' loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	245	320
Stress color 'quad' loop	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	MONOCHROME2	1	8	245	320
Report	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	600	800

3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	MONOCHROME2	1	8	1024 (726 If from QLAB IMT plug-in)	1152

10. YBR, JPEG Compressed

	Resultant Attribute Values						
Image Type	Transfer Syntax (0002,0010)	File SOP Class UID (0002.0002)	Photometric Interpretation (0028,0004)	Samples Per Pixel (0028, 0002)	Bits allocated (0028, 0100)	Rows (0028, 0010)	Cols (0028, 0011)
2D B&W Image	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	YBR_FULL_422	3	8	600 (540 without top border)	800
2D color Image	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	YBR_FULL_422	3	8	600 (540 without top border)	800
2D B&W loop	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	YBR_FULL_422	3	8	600 (540 without top border)	800
2D color loop	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	YBR_FULL_422	3	8	600 (540 without top border)	800
Stress B&W 'quad' loop	JPEG Baseline Process 1 (1.2.840.10008.1.	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.	YBR_FULL_422	3	8	245	320

	2.4.50)	1.4.1.1.3.1)					
Stress color 'quad' loop	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	YBR_FULL_422	3	8	245	320
Report	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	YBR_FULL_422	3	8	600	800
3D single frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	600 (540 without top border)	800
3D multi frame	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Multi-frame Image Storage (1.2.840.10008.5.1.4.1.1.3.1)	RGB	3	8	600 (540 without top border)	800
Panview	Explicit VR Little Endian (1.2.840.10008.1.2.1)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	RGB	3	8	691	1024
QLAB	JPEG Baseline Process 1 (1.2.840.10008.1.2.4.50)	Ultrasound Image Storage (1.2.840.10008.5.1.4.1.1.6.1)	YBR_FULL_422	3	8	1024 (726 If from QLAB IMT plug-in)	1152

Tables 8: Image Attributes based upon Photometric Interpretation and Image Type

Notes:

1. The bits allocated (0028,0100) and the bits stored (0028,0101) are always the same.
2. The high bit (0028,0102) is always one less than the bits allocated.
3. The pixel representation (0028,0103) is always zero
4. Ultrasound data present (0028,0014) is always 1 (true).
5. 3D and Panview images always employ an RGB photometric interpretation irrespective of the 'image format' configured by the user. Also Panview images are larger (691 rows by 1024 columns) than 2D images.
6. 2D stills and loops may be acquired including the top and right border information or without borders. Stress 'quad' loops are 245 rows by 320 columns and never have top or side information borders.
7. See section 3.2.1 for a description of PanView 'dataset' files that are only exported to removable media.

2.1.2.1.2.1 SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class

The HD11 AE uses the Ultrasound Image IOD Modules for both Ultrasound Image (1.2.840.10008.5.1.4.1.1.6.1) and Ultrasound Multi-frame Image (1.2.840.10008.5.1.4.1.1.3.1) IODs as follows in the following sub-sections:

2.1.2.1.2.1.1 Ultrasound Image & Ultrasound multi-frame image Storage Modules Used

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - US Image & US multi-frame image Storage Modules Used

For each SOP class, DICOM defines what modules must be supported. A module simply defines a set of DICOM tags that must be present in the DICOM file.

Per the DICOM standard (PS3.3-2004 A.1.3), modules may be mandatory, optional or conditionally mandatory:

- **Mandatory** modules shall be supported per the definitions, semantics and requirements defined in PS3.3-2004, Annex C.
- **User Option** Modules may or may not be supported. If an optional Module is supported, the Level 1 (and
  Level 2) Attribute Types specified in the Modules shall be supported.
- **Conditional** Modules are Mandatory Modules if specific conditions are met. If the specified conditions are not met, this Module shall not be supported; that is, no information defined in that Module shall be sent.

The following table defines the modules that are supported by HD11 for ultrasound images when they are sent to the storage SCP (PACS), either Primary or Secondary.

Note1: Modules that are not mandatory and not supported by HD11 are not listed in the table.

Note 2: These modules are also supported for export to removable media (MOD, CR-R or CD-RW).

	US Image (Still)		**US Multi-frame Image (Loop)**	
Module	**DICOM Standard**	**Supported in HD11**	**DICOM Standard**	**Supported in HD11**
Patient	Mandatory	✓	Mandatory	✓
General Study	Mandatory	✓	Mandatory	✓
Patient Study	User Option	✓	User Option	✓
General Series	Mandatory	✓	Mandatory	✓
Synchronization	User Option		User Option	
General Equipment	Mandatory	✓	Mandatory	✓
General Image	Mandatory	✓	Mandatory	✓
Image Plane	Not allowed for ultrasound (US) images	User can configure this to be included to be interoperable with non-ultrasound viewers.	Not allowed for ultrasound (US) images	User can configure this to be included to be interoperable with non-ultrasound viewers.
Image Pixel	Mandatory	✓	Mandatory	✓
Palette Color Lookup Table	Conditional	✓	Conditional	✓
Cine	Unused		Mandatory	✓
Multi-Frame	Unused		Mandatory	✓
US Region Calibration	User Option	✓	User Option	✓
US Image	Mandatory	✓	Mandatory	✓
Curve Identification	Mandatory	Not used since Curve & Curve Id is mutually	Mandatory	Not used since Curve & Curve Id is mutually

	US Image (Still)		**US Multi-frame Image (Loop)**	
Module	**DICOM Standard**	**Supported in HD11**	**DICOM Standard**	**Supported in HD11**
		exclusive with Image Pixel		exclusive with Image Pixel
Curve	Mandatory		Mandatory	
SOP Common	Mandatory	✓	Mandatory	✓

For each module that must be present in an ultrasound image that is going to be sent to a storage SCP, a subsequent sub-section defines the tags in that module that are supported by HD11.

Note: *Unused type "3" tags are **not** listed.*

2.1.2.1.2.1.2 Patient Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Patient Module

The Patient Module (PS3.3-2004, Table C.7.1.1) defines attributes that provide information about the Patient who is the subject of a diagnostic Study. This module is mandatory for storage of ultrasound single-frame or multi-frame images.

*Note: If MWL is enabled, the user-generated values in the table below may be provided by the modality worklist. The user can override the MWL value if desired.

					Generated by		
Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Usr**	**Sys**	**Value**
Patient's Name	0010, 0010	2	PN	Patient's full name.	✓		Entered by user from the Patient ID screen.
Patient ID	0010, 0020	2	LO	Primary hospital identification number or code for the patient.	✓	✓[A]	Entered by user from the Patient ID screen. This maps to the MRN field of the Patient ID screen and can be up to a maximum of 64 characters. Note A: If the user does not enter a value, the system will automatically generate one.
Patient's Birth Date	0010, 0030	2	DA	Birth date of the patient.	✓		Entered by user from the Patient ID screen. If the user does not enter a value, the system includes this tag as the empty string.
Patient's Sex	0010, 0040	2	CS	Sex of the named patient. Enumerated Values: M = male F = female O = other	✓		Selected from a drop-down list, by the user, from the Patient ID screen. If the user selects 'Unknown', this attribute is the empty string.
Other Patient IDs	0010, 1000	3	LO	Other identification numbers or codes used to identify the patient.	✓		Entered by user from the Patient ID screen. This maps to the Alternate ID Number of the Patient ID screen. If the user does not enter a value, the tag is not sent.

2.1.2.1.2.1.3 General Study Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - General Study Module

The General Study Module (PS3.3-2004, Table C.7.2.1) defines Attributes that provide information about the Study that was performed. This module is mandatory for storage of ultrasound single-frame or multi-frame images.

*Note: If MWL is enabled, the user-generated values in the table below may be provided by the modality worklist. The user can override the MWL value if desired.

Atribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
Study Instance UID	0020, 000D	1	UI	A unique identifier for the Study.		✓	<u>No MWL Server</u> A system generated Unique Identifier of the form: 1.2.840.113543.6.6.4.1.Mnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn (64 characters) The first part is for HD11. The right-most digits (nnnnnn) are unique based on timestamp and machine characteristics. Note: The 24th character (denoted by 'M') is always '6', however this may be changed in future releases and an implementation should not rely on knowledge of this character. <u>MWL Server</u> The value provided by the MWL server.
Study Date	0008, 0020	2	DA	Date the Study started. The format is yyyymmdd		✓	The system computes this value as the date the study was created. Every image (with the same Study Instance UID) will have the same Study date.
Study Time	0008, 0030	2	TM	Time the Study started. The format is hhmmss		✓	The system computes this value as the time the study was created. Every image (with the same Study Instance UID) will have the same Study time.
Referring	0008,	2	PN	Physician(s) who	✓		Entered by user from the Patient

Atribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
Physician Name	0090			are responsible for overall patient care at time of Study			ID screen. If the user does not enter a value, the system includes this tag as the empty string. The characters entered map to the 'Last Name' component of the Person Name. Note: If MWL is defined, only the last and first name components of the name are used.
Study ID	0020, 0010	2	SH	User or equipment generated Study identifier.		✓	A system generated Study identifier that is unique only within the HD11 system that generated the study. The Study Identifier starts at 1 and is incremented by one for each new study created on that system. Study Identifiers will not be unique across multiple HD11 systems.
Accession Number	0008, 0050	2	SH	A RIS generated number, which identifies the order for the Study.	✓		Entered by user from the Patient ID screen. If the user enters a value for this field, then it must be unique. If the user does not enter a value, the system includes this tag as the empty string.
Study Description	0008, 1030	3	LO	Institution-generated description or classification of the Study (component) performed.	✓		Configurable by the user through setup. Can either be a fixed list or (for users with a MWL server), can be obtained from the MWL Server. The string used will be the first non-empty string from the

Atribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
							following list: o Requested Procedure description tag (0032,1060), o Scheduled Procedure Step description tag (0040,0007) o Scheduled Procedure Step, "Code Meaning" tag (0008,0104) o Reason for the requested procedure tag (0040,1002) o Reason for imaging service request tag (0040,2001)

2.1.2.1.2.1.4 Patient Study Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Patient Study Module

The Patient Study Module (PS3.3-2004, Table C.7.2.2) defines Attributes that provide information about the Patient at the time the Study was performed. This module is optional for storage of ultrasound single-frame or multi-frame images.

*Note: If MWL is enabled, the user-generated values in the table below may be provided by the modality worklist. The user can override the MWL value if desired.

					Generated by		
Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Usr**	**Sys**	**Value**
Patient's Size	0010, 1020	3	DS	Length or size of the Patient, in meters.	✓		Entered by user from the Patient ID screen. If the user does not enter a value, this tag is not sent.
Patient's Weight	0010, 1030	3	DS	Weight of the Patient, in kilograms.	✓		Entered by user from the Patient ID screen. If the user does not enter a value, this tag is not sent.
Additional Patient's History	0010, 21B0	3	LT	Additional information about the Patient's medical history.	✓		Entered by user from the Patient ID screen. If the user does not enter a value, this tag is not sent.

2.1.2.1.2.1.5 General Series Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - General Series Module

The General Series Module (PS3.3-2004, Sec C.7.3.1, Table C.7-5) defines Attributes that identify and describe general information about a Series within a Study. . This module is mandatory for storage of ultrasound single-frame or multi-frame images. . Each HD11 Study has exactly one Series.

*Note: If MWL is enabled, the user-generated values in the table below may be provided by the modality worklist. The user can override the MWL value if desired.

					Generated by		
Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Usr**	**Sys**	**Value**
Modality	0008, 0060	1	CS	Type of equipment that originally acquired the data used to create the images in this Series.		✓	Always "US" for ultrasound
Series Instance UID	0020, 000E	1	UI	Unique identifier of the Series.		✓	The Series Instance UID is derived from the Study Instance UID by changing the 24th character (denoted by 'M' in the template above) from '6' to '3' (or '5' for stress protocol studies). Note: In future releases the Series

Attribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
							Instance UID may be generated by alternative means. A DICOM server implementation should not use the 24th character to define behavior. <u>No MWL Server</u> A system generated Unique Identifier of the form: 1.2.840.113543.6.6.4.1.Mnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn (64 characters) The first part is for HD11. The right-most digits (nnnnnn) are unique based on timestamp and machine characteristics. <u>MWL Server</u> Format is variable as the Series Instance UID is derived from the Study instance UID that is provided by the MWL server.
Series Number	0020, 0011	2	IS	Number of the series		✓	HD11 studies have one series for images and one series each for each type of SR . Series number is always "1" for image series.
Performing Physician's Name	0008, 1050	3	PN	Name of the physicians administering the Series.	✓		Entered by user from the Patient ID screen. This maps to the 'Performed by' field of the Patient ID screen. If the user does not enter a value, this tag is not sent. The intent is for the user to enter the performing physicians initials and the system limits the user to entering a maximum of five characters. The

Attribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
							characters entered map to the 'Last Name' component of the Person Name.
Series Description	0008, 103E	3	LO	User provided description of the Series.	✓		Entered by user from the Patient ID screen. This maps to the 'Indication' field of the Patient ID screen. If the user does not enter a value, this tag is not sent.
Operator's Name	0008, 1070	3	PN	Name of the operator (or technician) using the system.		✓	Entered by the system as the same text as 'Performing Physician's Name', (tag 0008,1050).
Patient Position	0018, 5100	2C	CS	Required for CT and MR images. See C.7.3.1.1.2 of the DICOM standard for Defined Terms and further explanation.	N/A	N/A	Not used as not required for Ultrasound (US).

2.1.2.1.2.1.6 General Equipment Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - General Equipment Module

The General Equipment Module (PS3.3-2004, Sec C.7.5.1, Table C.7-8) defines attributes that identify and describe the piece of equipment that produced a Series of Images. This module is mandatory for storage of ultrasound single-frame or multi-frame images.

Attribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
Manufacturer	0008, 0070	2	LO	Manufacturer of the equipment that produced the digital images.		✓	"Philips Medical Systems" Note: This is always in English irrespective of the locale since some tools (e.g. Philips QLAB) key behavior of the Manufacturer tag and look for the precise text shown above.
Institution Name	0008, 0080	3	LO	Institution where the equipment that produced the composite instances is located.	✓		Entered by the user from the 'System' tab in the 'Setup' screen ('Top Border' button). Note: If the user imports an EnVisor or HD11 study that was generated at another institution and opens the study the institution name displayed along the top border of the system screen is the institution viewing the images not the institution where the image was acquired. The institution name where the image was acquired can however be burned into the image. Also, if the user exports the study to removable media or to a networked PACS and changes the format of the image data in some way either by exporting it in a different image format from the internal format (Palette Color, RLE) or by applying a display compensation curve, then the institution name is changed to the current institution.

2.1.2.1.2.1.7 General Image Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - General Image Module

The General Image Module (PS3.3-2004, Sec C.7.6.1, Table C.7-9) defines Attributes that describe an image within a particular series. This module is optional for storage of ultrasound single-frame or multi-frame images.

All attributes are system generated.

Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Value**
Instance Number	0020, 0013	2	IS	A number that identifies this image. Note: This Attribute was named Image Number in earlier versions of this Standard.	The system computes this value as a unique number for each image in a study. For the first image in a new study the Instance Number is 1. The second image is numbered 2 and the Instance Number continues to be incremented by for each acquired image. Gaps may be present if images were deleted before DICOM store was requested.
Patient Orientation	0020, 0020	2C	CS	Patient direction of the rows and columns of the	The system sends the empty tag for non 3D images and

Attribute Name	Tag	Type	VR	Description	Value
				image.	is not sent for PanView images.
Content Date	0008, 0023	2C	DA	The date the image pixel data creation started. Required if image is part of a series in which the images are temporally related. *Note: This Attribute was formerly known as Image Date.*	The system computes this value as the date that image was acquired. . The format is yyyymmdd.
Content Time	0008, 0033	2C	TM	The time the image pixel data creation started. Required if image is part of a series in which the images are temporally related. *Note: This Attribute was formerly known as Image Time.*	The system computes this value as the time that image was acquired. The format is hhmmss
Image Type	0008, 0008	3	CS	Image identification characteristics.	The system computes this value as the four component multi-value attribute: "<Pixel Data Characteristics> / <Patient Examination Characteristics> / <Modality Specific Characteristics> / <Implementation Specific Identifiers>" **<Pixel Data Characteristics>** Palette Color & RGB:

Attribute Name	Tag	Type	VR	Description	Value
					"ORIGINAL" denotes original source-data YBR: "DERIVED" denotes pixels that have been derived from the original – in this case by lossy compression. MONOCHROME2: "DERIVED" denotes pixels that have been derived from the original – in this case by grayscale transformations. **<Patient Examination Characteristics>** Always "PRIMARY" **<Modality Specific Characteristics>** This is based on the user-selected entry in the drop down list 'Additional Data Type' on the Patient Id screen. It is mapped to the most appropriate value from the DICOM standard (Ex: "ABDOMINAL"). **<Implementation Specific Identifiers>"** Always blank.

Attribute Name	Tag	Type	VR	Description	Value
					Note: The third and fourth fields are **not** present in PanView images.
Acquisition Date	0008, 0022	3	DA	The date the acquisition of data that resulted in this image started	The system uses the same value as the Content Date, tag 0008,0023.
Acquisition Time	0008, 0032	3	TM	The time the acquisition of data that resulted in this image started	The system uses the same value as the Content time, tag 0008,0033.
Acquisition Datetime	0008, 002A	3	DT	The date and time that the acquisition of data that resulted in this image started.	The system generates this as a combination of Acquisition Date and Acquisition Time. . The format is yyyymmddhhmmss
Image Comments	0020, 4000	3	LT	User-defined comments about the image.	Images (2D,3D etc): Not Used Reports: "Report Version x Page x of x"
Lossy Image Compression	0028, 2110	3	CS	Specifies whether an Image has undergone lossy image compression. Enumerated Values: 00 = Image has NOT been subjected to lossy image compression. 01 = Image has been subjected to lossy image compression.	00 - for uncompressed images or RLE compressed images. 01 – for JPEG compressed images.

2.1.2.1.2.1.8 Image Plane Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Image Plane Module

The Image Plane Module (PS3.3-2004, Sec C.7.6.2, Table C.7-10) defines attributes that describe the pixel array of a two dimensional image plane. This module is optional for storage of ultrasound single-frame or multi-frame images.

Attribute Name	Tag	Type	VR	Description	Value
Pixel Spacing	0028, 0030	1	DS	Physical distance in the patient between the center of each pixel, specified by a numeric pair – adjacent row spacing (delimiter) adjacent column spacing in mm	If specified by the user in DICOM Setup, Media Export Setup, or for an individual study export AND the image contains only one 2D calibration region and no Doppler or M-Mode calibration regions, then this tag is written to the DICOM file.

2.1.2.1.2.1.9 Image Pixel Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Image Pixel Module

The Image Pixel Module (PS3.3-2004, Sec C.7.6.3, Table C.7-11) defines Attributes that describe the pixel data of an image. This module is mandatory for storage of ultrasound single-frame or multi-frame images.

Attribute Name	Tag	Type	VR	Description	Value
Samples per Pixel	0028, 0002	1	US	Number of samples (planes) in this image.	Based on the 'Image Format' that is set by the user in DICOM Setup. Palette Color Mode: 2D B/W and Color stills/loops: 1 3D & Panview: 3 Reports & QLAB: 1 RGB Mode: 2D B/W and Color stills/loops: 3 3D & Panview: 3 Reports & QLAB: 3 YBR Mode: 2D B/W and Color stills/loops: 3 3D & Panview: 3

Attribute Name	Tag	Type	VR	Description	Value
					Reports & QLAB: 3 Monochrome Mode: Always: 1
Photometric Interpretation	0028, 0004	1	CS	Specifies the intended interpretation of the pixel data.	2D Images, Reports & QLAB: Based on the 'Image Format' that is set by the user in DICOM Setup. Can be either: PALETTE COLOR, RGB, YBR_FULL_422 or MONOCHROME2 3D & Panview Images: Always RGB
Rows	0028, 0010	1	US	Number of rows in the image.	2D B/W & Color stills/loops acquired with top & right border: 600 2D B/W & Color stills/loops acquired without borders: 540 2D B/W & Color quad-sized loops from stress: 245 Reports: 600 PanView: 691 QLAB from IMT plug-in: 726 QLAB (all others): 1024
Columns	0028, 0011	1	US	Number of columns in the image	2D B/W & Color stills/loops acquired with top & right border: 800 2D B/W & Color stills/loops acquired without borders: 800 2D B/W & Color quad-sized loops from stress: 320

Attribute Name	Tag	Type	VR	Description	Value
					Reports: 800 PanView: 1024 QLAB: 1152
Bits Allocated	0028, 0100	1	US	Number of bits allocated for each pixel sample.	Based on the 'Image Format' that is set by the user in DICOM Setup. Palette Color Mode: 2D B&W, 3D & PanView: 8 bits 2D Color, Reports & QLAB: 16 bits RGB Mode: 2D B&W, 3D & PanView: 8 bits 2D Color, Reports & QLAB: 8 bits YBR Mode: 2D B&W, 3D & PanView: 8 bits 2D Color, Reports & QLAB: 8 bits Monochrome Mode: 8 bits
Bits Stored	0028, 0101	1	US	Number of bits stored for each pixel sample.	Based on the 'Image Format' that is set by the user in DICOM Setup. The number of Bits Stored and Bits Allocated are always the same. Palette Color Mode: 2D B&W, 3D & PanView: 8 bits 2D Color, Reports & QLAB: 16 bits RGB Mode:

Attribute Name	Tag	Type	VR	Description	Value
					2D B&W, 3D & PanView: 8 bits 2D Color, Reports & QLAB: 8 bits YBR Mode: 2D B&W, 3D & PanView: 8 bits 2D Color, Reports & QLAB: 8 bits Monochrome Mode: 8 bits
High Bit	0028, 0102	1	US	Most significant bit for pixel sample data.	Based on the 'Image Format' that is set by the user in DICOM Setup. The High Bit is always one less than the Bits Allocated. Palette Color Mode: 2D B&W, 3D & PanView: 7 bits 2D Color, Reports & QLAB: 15 bits RGB Mode: 2D B&W, 3D & PanView: 7 bits 2D Color, Reports & QLAB: 7 bits YBR Mode: 2D B&W, 3D & PanView: 7 bits 2D Color, Reports & QLAB: 7 bits Monochrome Mode: 7 bits
Pixel Representation	0028, 0103	1	US	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values:	000H (Unsigned integers)

Attribute Name	Tag	Type	VR	Description	Value
				0000H = unsigned integer. 0001H = 2's complement	
Pixel Data	7FE0, 0010	1	OB	A data stream of the pixel samples which comprise the Image.	The pixel data of the DICOM image.
Planar Configuration	0028, 0006	1C	US	Indicates whether the pixel data are sent color-by-plane or color-by-pixel. Required if Samples per Pixel (0028,0002) has a value greater than 1.	Palette Color Images: Not present RGB Images: Always zero (color-by-pixel) YBR: Images: Always zero (color-by-pixel) Monochrome Images: Not present Note: 3D and Panview images are always RGB, therefore this tag will always be zero for 3D and Panview images even if the user defines the image export format to be Palette Color.
Pixel Aspect Ratio	0028, 0034	1C	IS	Ratio of the vertical size and horizontal size of the pixels in the image specified by a pair of integer values where the first value is the vertical pixel size, and the second value is the horizontal pixel size.	Always 1/1.
Red Palette Color Lookup Table	0028, 1101	1C	US	Specifies the format of the Red Palette Color Lookup Table	See 'Palette Color Lookup Table Module', section 2.1.2.1.2.1.10.

Attribute Name	Tag	Type	VR	Description	Value
Descriptor				Data	
Green Palette Color Lookup Table Descriptor	0028, 1102	1C	US	Specifies the format of the Green Palette Color Lookup Table Data	See 'Palette Color Lookup Table Module', section 2.1.2.1.2.1.10.
Blue Palette Color Lookup Table Descriptor	0028, 1103	1C	US	Specifies the format of the Blue Palette Color Lookup Table Data	See 'Palette Color Lookup Table Module', section 2.1.2.1.2.1.10..
Red Palette Color Lookup Table Data	0028, 1201	1C	OW	Red Palette Color Lookup Table Data.	See 'Palette Color Lookup Table Module', section 2.1.2.1.2.1.10.
Green Palette Color Lookup Table Data	0028, 1202	1C	OW	Green Palette Color Lookup Table Data.	See 'Palette Color Lookup Table Module', section 2.1.2.1.2.1.10.
Blue Palette Color Lookup Table Data	0028, 1203	1C	OW	Blue Palette Color Lookup Table Data.	See 'Palette Color Lookup Table Module', section 2.1.2.1.2.1.10.

2.1.2.1.2.1.10 Palette Color Lookup Table Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Palette Color Lookup Table Module

The Palette Color Lookup Module (PS3.3-2004, Sec C.7.9, Table C.7-22) defines Attributes that describe the Lookup table data for images with Palette Color photometric interpretation. This module is present for HD11 2D B/W and Color stills/loops but is not present in (RGB) files created by HD11's 3D/Panview application.

All attributes are system generated.

Attribute Name	Tag	Type	VR	Description	Value
Red Palette Color Lookup Table Descriptor	0028, 1101	1C	US	Specifies the format of the Red Palette Color Lookup Table Data	Used only for 2D Loops: 256, 0, 16 Stills: 0, 0, 16 ***This tag and other tags related to Palette Color are not present in 3D/PanView since these files are RGB.***
Green Palette Color Lookup Table Descriptor	0028, 1102	1C	US	Specifies the format of the Green Palette Color Lookup Table Data	Used only for 2D Loops: 256, 0, 16 Stills: 0, 0, 16
Blue Palette Color Lookup	0028, 1103	1C	US	Specifies the format of the Blue Palette Color Lookup Table Data	Used only for 2D Loops: 256, 0, 16 Stills: 0, 0, 16

Attribute Name	Tag	Type	VR	Description	Value
Table Descriptor					
Red Palette Color Lookup Table Data	0028, 1201	1C	OW	Red Palette Color Lookup Table Data.	Used only for 2D.
Green Palette Color Lookup Table Data	0028, 1202	1C	OW	Green Palette Color Lookup Table Data.	Used only for 2D.
Blue Palette Color Lookup Table Data	0028, 1203	1C	OW	Blue Palette Color Lookup Table Data.	Used only for 2D.
Segmented Red Palette Color Lookup Table Data	0028, 1221	1C	OW	Segmented Red Palette Color Lookup Table Data.	Not used
Segmented Green Palette Color Lookup Table Data	0028, 1222	1C	OW	Segmented Green Palette Color Lookup Table Data.	Not used
Segmented Blue Palette Color Lookup Table Data	0028, 1223	1C	OW	Segmented Blue Palette Color Lookup Table Data.	Not used

2.1.2.1.2.1.11 Cine Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Cine Module

The Cine Module (PS3.3-2004, Sec C.7.6.5, Table C.7-13) defines Attributes of a Multi-frame Cine image. This module is mandatory for Multi-frame images but is not used for Single-frame images.

All attributes are system generated.

Attribute Name	Tag	Type	VR	Value
Recommended Display Frame Rate	0008, 2144	3	IS	Used for Multiframe
Cine Rate	0018, 0040	3	IS	Used for Multiframe
Effective Series Duration	0018, 0072	3	DS	Used for Multiframe
Frame Time Vector	0018, 1065	1C	DS	An array that contains the real time increments (in msec) between frames for a Multi-frame image. Present if Frame Increment Pointer (0028,0009) points to Frame Time Vector.
Frame Time	0018, 1063	1C	DS	Nominal time (in msec) per individual frame. Present if Frame Increment Pointer (0028,0009) points to Frame Time.

2.1.2.1.2.1.12 Multi-Frame Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - Multi-Frame Module

The Multi-Frame Module (PS3.3-2004, Sec C.7.6.6, Table C.7-14) defines Attributes of a Multi-frame pixel data image. This module is mandatory for Multi-frame images but is not used for Single-frame images. All attributes are system generated.

Attribute Name	Tag	Type	VR	Value
Number of Frames	0028, 0008	1	IS	Used
Frame Increment Pointer	0028, 0009	1	AT	Configurable by the user in DICOM Setup. If the user selects a loop timing preference where each frame in a loop has the same duration then Frame Increment Pointer takes the value 0018,1063 (Frame Time). If the user selects a loop timing preference where each frame in a loop has the different duration then Frame Increment Pointer takes the value 0018,1065 (Frame Time Vector).

2.1.2.1.2.1.13 US Region Calibration Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - US Region Calibration Module

The US Region Calibration Module (PS3.3-2004, Sec C.8.5.5.1, Table C.8-17) defines Attributes that describe an ultrasound region calibration. This module is optional for ultrasound.

All attributes are system generated.

Atribute Name	Tag	Type	VR	Value
Sequence of Ultrasound Regions	0018, 6011	1	SQ	Used
Region Spatial Format	0018, 6012	1	US	Used
Region Data Type	0018, 6014	1	US	Used
Region Flags	0018, 6016	1	UL	Used
Region Location Min X0	0018, 6018	1	UL	Used
Region Location Min Y0	0018, 601A	1	UL	Used
Region Location Max X1	0018, 601C	1	UL	Used

Atribute Name	Tag	Type	VR	Value
Region Location Max Y1	0018, 601E	I	UL	Used
Reference Pixel X0	0018, 6020	I	SL	Used
Reference Pixel Y0	0018, 6022	I	SL	Used
Physical Units X Direction	0018, 6024	I	US	Used
Physical Units Y Direction	0018, 6026	I	US	Used
Ref Pixel Physical Value X	0018, 6028	I	FD	Used
Ref Pixel Physical Value Y	0018, 602A	I	FD	Used
Physical Delta X	0018, 602C	I	FD	Used
Physical Delta Y	0018, 602E	I	FD	Used

2.1.2.1.2.1.14 US Image Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - US Image Module

The US Image Module (PS3.3-2004, Sec C.8.5.6, Table C.8-18) defines attributes that describe ultrasound images. This module is mandatory for storage of ultrasound single-frame or multi-frame images.

Attribute Name	Tag	Type	VR	Value
Samples per Pixel	0028, 0002	1	US	See 'Image Pixel Module' Section 2.1.2.1.2.1.9.
Photometric Interpretation	0028, 0004	1	CS	See 'Image Pixel Module' Section 2.1.2.1.2.1.9.
Bits Allocated	0028, 0100	1	US	See 'Image Pixel Module' Section 2.1.2.1.2.1.9.
Bits Stored	0028, 0101	1	US	See 'Image Pixel Module' Section 2.1.2.1.2.1.9.
High Bit	0028, 0102	1	US	See 'Image Pixel Module' Section 2.1.2.1.2.1.9.
Planar Configuration	0028, 0006	1C	US	See 'Image Pixel Module' Section 2.1.2.1.2.1.9.
Pixel Representation	0028, 0103	1	US	Always zero

Attribute Name	Tag	Type	VR	Value
Frame Increment Pointer	0028, 0009	1C	AT	See 'Multi-Frame Module' section 2.1.2.1.2.1.12
Image Type	0008, 0008	2	CS	See 'General Image Module' 2.1.2.1.2.1.7.
Lossy Image Compression	0028, 2110	1C	CS	See 'General Image Module' 2.1.2.1.2.1.7.
Ultrasound Color Data Present	0028, 0014	3	US	"0" when image format is MONOCHROME2, "1" for all other image formats.
Number of Stages	0008, 2124	2C	IS	Number of stages in a protocol. *For stress Multiframe images only, or else this tag is not used.*
Number of Views in Stage	0008, 212A	2C	IS	Number of views in a stage. *For stress Multiframe images only*
Stage Name	0008, 2120	3	SH	Name of stage in a protocol. *For stress Multiframe images only*
Stage Number	0008, 2122	3	IS	Number of stage in a protocol, starting with one. *For stress Multiframe images only*
View Name	0008, 2127	3	SH	The name of the view. *For stress Multiframe images only*
View Number	0008, 2128	3	IS	The number of the view, starting with one. *For stress Multiframe images only*
Number of Event Timers	0008, 2129	3	IS	If the stage requires a timer, the number of event timers used at the time of acquisition of a Multi-frame image.
Event Elapsed Time(s)	0008, 2130	3	DS	If the stage requires a timer, an array of values associated with each event timer. Units in milliseconds.
Event Timer Name(s)	0008, 2132	3	LO	If the stage requires a timer, the name that identifies the event timer.
Acquisition Datetime	0008, 002A	1C	DT	See 'General Image Module' 2.1.2.1.2.1.7
Heart Rate	0018, 1088	3	IS	Beats per minute.

Attribute Name	Tag	Type	VR	Value
Transducer Data	0018,5010	3	CS	Name of the transducer that was in use when the image was acquired. Since the DICOM standard specifies a VM of 3, the last two fields are written as "UNUSED".
Transducer Type	0018, 6031	3	LO	SECTOR_PHASED, LINEAR, CURVED LINEAR *Only used for 2D or 3D images; not used for doppler-only images (i.e. pencil probes)*
Processing Function	0018,5020	3	LO	Manufacturer defined description of processing of echo information. Data may include code or description of gain (initial, overall, TGC, dynamic range, etc.), preprocessing, postprocessing, Doppler processing parameters, e.g. cutoff filters, etc., as used in generating a given image. With this release of the system the attribute contains just one piece of information - the exam/preset that was active when the image was acquired. Note: If a user creates a new preset, the value will still be the system exam/preset from which the new preset was derived and NOT the user defined preset.

2.1.2.1.2.1.15 SOP Common Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Ultrasound Image Storage SOP Class
            - SOP Common Module

The SOP Common Module (PS3.3-2004, Sec C.12.1, Table C.12-1) defines the Attributes that are required for proper functioning and identification of associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD. . This module is mandatory for storage of ultrasound single-frame or multi-frame images.

All attributes are system generated.

Attribute Name	Tag	Type	VR	Value
SOP Class UID	0008, 0016	1	UI	1.2.840.10008.5.1.4.1.1.6.1 (Single Frame) or 1.2.840.10008.5.1.4.1.1.3.1 (Multi-Frame) or 1.2.840.10008.5.1.4.1.1.88.33 (for SR)
SOP Instance UID	0008, 0018	1	UI	A system generated SOP Instance UID of the format 1.2.840.113543.6.6.4.1.6nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn (64 characters) The first part is for HD11. The right-most digits (nnnnnn) are unique based on timestamp and machine characteristics.
Specific Character Set	0008, 0005	1C	CS	This is the character set that expands or replaces the Basic Character set. The attribute is provided

				when the system requires characters beyond the Basic Graphic set, otherwise the attribute is not provided. If provided the attribute contains all the characters sets used (this is a multi-value attribute). See section 0 titled "HD11 also supports on cart QLAB where the user can perform QLAB quantification on the HD11 system of images acquired by the system. Support for Extended Character Sets" for more information on the character sets that this system uses. The most likely scenario that would require a non Basic Character set would be when the system has been set to a locale that uses non Basic characters (e.g. Russia or Japan) AND the user has entered one of these characters into the Patient Identification screen,

2.1.2.1.2.2 SOP Specific Conformance Statement for Comprehensive Structured Report Storage SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Comprehensive Structured Report Storage SOP Class

The following table defines the modules that are supported by HD11 for SR when they are sent to a SR Storage SCP (PACS).

IE	Module	Reference
Patient	Patient	2.1.2.1.2.1.2
Study	General Study	2.1.2.1.2.1.3
	Patient Study	2.1.2.1.2.1.4
Series	SR Document Series	2.1.2.1.2.2.1
Equipment	General Equipment	2.1.2.1.2.1.6
Document	SR Document General	2.1.2.1.2.2.2
	SR Document Content	2.1.2.1.2.2.3
	SOP Common	2.1.2.1.2.1.15

For 'Patient', 'General Study', 'Patient Study', 'General Equipment' and 'SOP Common' modules, attribute tags supported by HD11 are defined under SOP specific conformance for US Image module. For the rest of the modules, following subsections define the tags that are supported by HD11.

2.1.2.1.2.2.1 SR Document Series Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Comprehensive Structured Report Storage SOP Class
            - SR Document Series Module

Attribute Name	Tag	Type	VR	Description	Generated by Usr	Generated by Sys	Value
Modality	0008, 0060	1	CS	Modality type. Enumerated Value: SR = SR Document		✓	SR
Series Instance UID	0020,000E	1	UI	Unique identifier of the Series.		✓	This is in the same format as Series Instance UID for Image.
Series Number	0020,0011	1	IS	A number that identifies the Series.		✓	Series number for SR series always starts from 2. If a study has two SRs (for example obstetric and cardiac) the series number for these two SRs would be 2 and 3.
Referenced Performed Procedure Step Sequence	0008,1111	2	SQ	Identifies the Performed Procedure Step SOP Instance for which the Series is created.		✓	If an MPPS server is configured, this sequence identifies MPPS SOP instance created for this study.
>Referenced SOP Class UID	0008,1150	1C	UI	Identifies the referenced SOP Class.		✓	MPPS SOP Class = "1.2.840.10008.3.1.2.3.3"
> Referenced SOP Instance UID	0008,1155	1C	UI	Identifies the referenced SOP Instance.		✓	MPPS instance UID of the performed procedure step generating this SR.

2.1.2.1.2.2.2 SR Document General Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Comprehensive Structured Report Storage SOP Class
            - SR Document General Module

					Generated by		
Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Usr**	**Sys**	**Value**
Instance Number	0020,0013	1	IS	A number that identifies the SR Document.		✓	The system computes this value as a unique number for each SR in a study. The value ascends as each SR is created and the value starts at "0" for each study.
Completion Flag	0040, A491	1	CS	The estimated degree of completeness of this SR Document.		✓	PARTIAL
Verification Flag	0040, A493	1	CS	Indicates whether this SR Document is Verified.		✓	UNVERIFIED
Content Date	0008,0023	1	DA	The date the document content creation started.		✓	Date of the SRDocument creation.
Content Time	0008,0033	1	TM	The time the document content creation		✓	Time of the SRDocument creation.

				started.			
Referenced Request Sequence	0040, A370	1C	SQ	Identifies Requested Procedures which are being fulfilled (completely or partially) by creation of this Document.		✓	This sequence will be present in the study has been started from the Modality work list.
>Study Instance UID	0020,000D	1	UI	Unique identifier for the Study.		✓	As received from MWL.
>Referenced Study Sequence	0008,1110	2	SQ	Uniquely identifies the Study SOP Instance.		✓	This sequence will be present with 0 items in the sequence.
>Accession Number	0008,0050	2	SH	Accession number		✓	As received from MWL
>Requested Procedure ID	0040,1001	2	SH	Requested Procedure ID		✓	As received from MWL
>Requested Procedure Description	0032,1060	2	LO	Description of the requested procedure		✓	As received from MWL
>Requested Procedure Code Sequence	0032,1064	2	SQ	A sequence that conveys the requested procedure.		✓	Will be present with no items.

2.1.2.1.2.2.3 SR Document Content Module

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Storage of DICOM studies to a PACS
        - Proposed Presentation Context
          - SOP Specific Conformance Statement for Comprehensive Structured Report Storage SOP Class
            - SR Document Content Module

					Generated by		
Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Usr**	**Sys**	**Value**
Content Template Sequence	0040, A504	1C	SQ	Template that describes the content of this SR Document.		✓	
>Template Identifier	0040, DB00	1	CS	Template Identifier		✓	5000 (for ob/gyn) or 5200 (for cardiac)
>Mapping Resource	0008,0105	1	CS			✓	DCMR
Content Sequence	0040, A730	1C	SQ	Sequence of Content Items.		✓	Sequence of content items as defined in TID5000 (Ob/GYN) or TID5200 (Cardiac)
>Relationship Type	0040, A010	1	CS	The type of relationship between parent content item and this item.		✓	CONTAINS
>Include Document Relationship Macro							Refer to appendix 0.A.1 for OB/GYN content and appendix A.3 for cardiac content.

>Include Document Content Macro							Refer to appendix 0.A.1 for OB/GYN content and appendixA.3for cardiac content.

2.1.2.2 Issuing of Storage Commitment requests to a PACS

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Issuing of Storage Commitment requests to a PACS

HD11 provides Standard Conformance to the following DICOM V3.0 **Storage Commitment** SOP Class as an SCU.

SOP Class Name	**SOP Class UID**	**Role**
Storage Commitment Push Model	1.2.840.10008.1.20.1.1	SCU

Table 9: SOP Class Supported by Storage Commitment service

HD11 sends images to the storage server for permanent storage. The request for Storage Commitment may then be transmitted from HD11 together with a list of references to one or more SOP instances. This action is invoked through the DIMSE N-ACTION primitive.

2.1.2.2.1 Associated Real-World Activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Issuing of Storage Commitment requests to a PACS
        - Associated Real-World Activity

Storage Commitment is initiated when a study is successfully exported to the Primary Storage SCP. Storage to the Primary Storage SCP can be performed manually by the user, or automatically at the end of study (batch mode) or after each image acquisition (Send As You Go mode). The Primary Storage SCP and Storage Commitment SCP can be different AE's.

Storage Commitment Association Behavior (By Save Study or Send As You Go)

User Action	**DICOM Activity – Storage Commitment Device Association**	**Association Status**
Save Study (Or Image acquisition in Send As You Go)	Each Save Study operation will initiate an association with the SC server, and send an N-Action Request, containing a list of all images that need to be committed. The Association is then released after receiving the N-ACTION-RSP from the SC Server. In Send As You Go mode, each image acquisition initiates the same DICOM activity as Save Study.	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.

2.1.2.2.2 Proposed Presentation Contexts

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Issuing of Storage Commitment requests to a PACS
        - Proposed Presentation Contexts

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Little Endian (Preferred, see Note)	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		

Table 10: Storage Commitment - Presentation Context

Note: If the Storage Commitment server accepts both Explicit VR Little Endian and Implicit VR Little Endian then HD11 will use Explicit VR Little Endian as transfer syntax.

In addition to the presentation contexts mentioned in the above table, HD11 will propose the presentation contexts associated with storage SOP classes. However, the actual association will always use the presentation context as mentioned in the table 7.

2.1.2.2.2.1 SOP Specific Conformance Statement for Storage Commitment SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Issuing of Storage Commitment requests to a PACS
        - Proposed Presentation Contexts
          - SOP Specific Conformance Statement for Storage Commitment SOP Class

HD11 provides standard conformance to the DICOM Storage Commitment Service Class.

HD11 supports the following elements for this SOP class as an SCU. The Transaction UID Attribute (0008,1195) value generated by HD11 uniquely identifies each Storage Commitment Request.

Action Type Name	Action Type ID	Attribute Name	Tag
Request Storage Commitment	1	Transaction UID	(0008,1195)
		Referenced SOP Sequence	(0008,1199)
		>Referenced SOP Class UID	(0008,1150)
		>Referenced SOP Instance UID	(0008,1155)

Table 11 – Storage Commitment Request – Attributes

Subsequently, HD11 expects N-EVENT-REPORT's from the storage commit server although HD11 does not assume that the event will arrive at any particular time. HD11 does not wait but will process the event whenever it arrives.

HD11 might be either powered down or disconnected from the network and used in portable mode, it is possible for the N-EVENT-REPORT to arrive from the Storage Commitment SCP while HD11 cannot receive it. If an outstanding N-EVENT-REPORT does not arrive within 96 hours, then HD11 will reissue the same Storage Commitment request. When the event arrives, HD11 returns an N-EVENT-REPORT response primitive with one of the following status codes.

Service Status	Further Meaning	Protocol Codes	Related Fields	Description
Success	Success	0000		N-EVENT-REPORT message understood.
Error	Failed	0110		N-EVENT-REPORT message was not processed successfully.

Table 12 - Storage Commitment status codes

2.1.2.3 Verification of the existence of DICOM server on the hospitals network

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Verification of the existence of DICOM server on the hospitals network

HD11 provides standard conformance to the DICOM V3.0 SOP Class as shown in Table 13.

SOP Class Name	SOP Class UID	Role
Verification SOP Class	1.2.840.10008.1.1	SCU

Table 13: SOP Class Supported by Verification Service

2.1.2.3.1 Associated Real-World Activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Verification of the existence of DICOM server on the hospitals network
        - Associated Real-World Activity

The user can verify the existence of a DICOM server on the hospitals network, through a button in the 'DICOM Setup' screen. When the user presses this button, HD11 will initiate the association.

2.1.2.3.2 Proposed Presentation Contexts

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Verification of the existence of DICOM server on the hospitals network
        - Proposed Presentation Contexts

Only one association is established for each verification attempt. However, the proposed presentation contexts not only includes the 'Verification SOP class' but also includes all the SOP classes that HD11 could possibly be connected to as Servers. This is done in order to retrieve the capabilities of the remote Server.

Table 14 lists all the proposed presentation contexts.

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Ultrasound Multiframe Image Store	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG baseline (Process 1)	1.2.840.10008.1.2.4.50		

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Image Store	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		JPEG baseline (Process 1)	1.2.840.10008.1.2.4.50		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Modality Worklist-Find	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		

Table 14: Proposed Presentation Contexts

2.1.2.3.2.1 SOP Specific Conformance Statement for the Verification SOP class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Verification of the existence of DICOM server on the hospitals network
        - Proposed Presentation Contexts
          - SOP Specific Conformance Statement for the Verification SOP class

The C-ECHO request primitive is sent to the Verification SCP. The Verification SCP with a status indicator of success returns the C-ECHO response primitive. The absence of a C-ECHO response within a specific timeout period is an indication that the server cannot be located through the Verification service.

2.1.2.4 Printing DICOM studies to a B&W or color printer

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer

HD11 provides standard conformance to the following DICOM V3.0 SOP Class as an SCU.

SOP Class Name	SOP Class UID	Role
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	SCU
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	SCU

Table 15: SOP Classes Supported by Print Service

The meta SOP classes are defined by the set of supported SOP classes.

The SOP class "Basic Grayscale Print Management Meta" is defined by the following set of supported SOP classes.

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

The SOP class "Basic Color Print Management Meta" is defined by the following set of supported SOP classes.

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

The following implementation remarks are important to understand HD11's usage of DICOM Print.

- The number of Film Boxes per Film Session is one.
- The number of images per Film Box is one.
- The images to be printed on one film are rendered by the HD11 into one logical image. This logical image is very large, depending on the pixel matrix size (pixels per line, lines per image), use of color or not. A rough indication is 20 Mbytes. One should take this into account when selecting the DICOM printer and the printer configuration (e.g. the amount of memory).
- HD11 will release the association when the print command is given (i.e. the NACTION Request for the Film Box); the association is not kept open for receiving N-EVENTREPORT's of the Printer SOP Class.

2.1.2.4.1 Associated Real World Activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Associated Real World Activity

HD11 issues Print Management requests to an SCP supporting the DICOM V3.0 Print services, in order to produce hard copy representations of DICOM images, based on user requests.

2.1.2.4.2 Proposed Presentation Contexts

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Proposed Presentation Contexts

Print AE supports the following Presentation Contexts for **Print**.

Abstract Syntax		**Transfer Syntax**			**Extended**
Name	**UID**	**Name List**	**UID List**	**Role**	**Negotiation**
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Explicit VR Little Endian (Preferred, see Note)	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Explicit VR Little Endian (Preferred, see Note)	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		

Table 16: Print Presentation Contexts

Note: If the print server accepts both Explicit VR Little Endian and Implicit VR Little Endian then HD11 will send the images using Explicit VR Little Endian.

HD11 provides standard conformance to all the supported SOP classes of the "meta" SOP Classes, "Basic Grayscale Print Management Meta" and "Basic Color Print Management Meta". These SOP Classes are –

1. Basic Film Session SOP Class
2. Basic Film Box SOP Class
3. Basic Grayscale Image Box SOP Class
4. Basic Color Image Box SOP Class
5. Printer SOP Class

The SOP specific conformance of these classes is described below.

2.1.2.4.2.1 SOP Specific Conformance to Basic Film Session SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Proposed Presentation Contexts
          - SOP Specific Conformance to Basic Film Session SOP Class

HD11 requests the following DIMSE-N commands for the Basic Film Session SOP Class: N-CREATE

I = Generated By

Attribute Name	Tag	Usage	Attribute Description	DICOM Notes	I		Value	
					Usr	Sys	Options	Default
Number of Copies	(2000, 0010)	U	Number of duplicate copies to print	DICOM supports an integer number.	✓		1 to 99	1
Print Priority	(2000, 0020)	U	Print priority sets the 'importance' of your print job relative to other jobs received by the printer.	DICOM supports: LOW, MEDIUM, HIGH Print priorities		✓	HIGH	
Medium Type	(2000, 0030)	U	The type of media the printer prints on.	DICOM Supports PAPER, CLEAR FILM & BLUE FILM s as well as 'Printer Specific' options	✓		PAPER CLEAR FILM BLUE FILM	Not Sent
Film Destination	(2000, 0040)	U	The processed film will be stored in a film magazine	DICOM supports PROCESSOR and MAGAZINE as well	✓		PROCESSOR MAGAZI	Not Sent

Attribute Name	Tag	Usage	Attribute Description	DICOM Notes	I		Value	
					Usr	Sys	Options	Default
			or processor.	as 'Printer Specific' options			NE	
Film Session Label	(2000, 0050)	U	Human readable label that identifies the film session.	Always sends "Philips Medical Systems"		✓	"Philips Medical Systems"	"Philips Medical Systems"

Table 17 Basic Film Session Attributes

2.1.2.4.2.2 SOP Specific Conformance to Basic Film Box SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Proposed Presentation Contexts
          - SOP Specific Conformance to Basic Film Box SOP Class

HD11 requests the following DIMSE-N commands for the Basic Film Box SOP Class: N-CREATE

I = Generated By

Attribute Name	Tag	Usage	Attribute Description	DICOM Notes	I		Value	
					Usr	Sys	Options	Default
Image Display Format	(2010, 0010)	M	Images are arranged on the film in a rectangular grid. The columns and rows control the layout.	DICOM Supports STANDARD\cols,rows as well as SLIDE, ROW/COL symmetric and printer specific options.	✓		STANDARD*cols,rows* *Cols:1..99,* *Rows:1..99* Note: Applied Value for this attribute (which is sent to the Print SCP) is always STANDARD\1, 1. This is because HD11 internally creates a single	Always set to STANDARD \1,1

Attribute Name	Tag	Usage	Attribute Description	DICOM Notes	I		Value	
					Usr	Sys	Options	Default
							1x1 image corresponding to one page. This (large) image is formed based on the user selected value (e.g. STANDARD\2, 3) and the images that are part of the Print request.	
Film Orientation	(2010, 0040)	U	The orientation of the printed film or paper.	DICOM Supports: PORTRAIT & LANDSCAPE	✓		PORTRAIT LANDSCAPE	PORTRAIT
Film Size ID	(2010, 0050)	U	The overall size of the film or paper.	DICOM Supports all the user options as well as 'Printer Specific' options	✓		8INX10IN, 8_5INX11IN, 10INX12IN, 10INX14IN, 11INX14IN, 11INX17IN, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM, A4, A3	8INX10IN
Magnification Type	(2010, 0060)	U	Interpolation type by which the printer magnifies or decimates the image in order to fit the	Defined Terms: REPLICATE BILINEAR CUBIC	✓		None Cubic Bilinear Replicate	Not Sent

Attribute Name	Tag	Usage	Attribute Description	DICOM Notes	I		Value	
					Usr	Sys	Options	Default
			image in the image box on film.	NONE			Printer Specific	
Min Density	(2010, 0120	U	Minimum density of the images on the film. If Min Density is lower than minimum printer density then Min Density is set to minimum printer density.	Entered in hundredths of Optical Density (OD)	✓		0 - 999	Not Sent
Max Density	(2010, 0130)	U	Maximum density of the images on the film. If Max Density is higher than maximum printer density than Max Density is set to maximum printer density.	Entered in hundredths of Optical Density (OD)	✓		0 - 999	Not Sent
Trim	(2010, 0140)	U	Draw frame box around each image	DICOM Supports: YES or NO		✓	"NO"	
Configuration Information	(2010, 0150)	U	Printer-specific configuration Information	DICOM supports a config ID # or a config string	✓		Config ID # Or Config string	Not Sent
Referenced Film Session Sequence	(2010, 0500)	M	Referenced Film Session Sequence	N/A		✓	Always set	

Attribute Name	Tag	Usage	Attribute Description	DICOM Notes	I		Value	
					Usr	Sys	Options	Default
>Referenced SOP Class UID	(0008, 1150)	M	>Referenced SOP Class UID	N/A		✓	Always set	
>Referenced SOP Instance UID	(0008, 1155)	M	>Referenced SOP Instance UID	N/A		✓	Always set	

Table 18 Basic Film Box Attributes

N-ACTION

HD11 provides all possible printer settings. For a specific printer, the user must check the manufacturer's documentation to determine the subset of available settings that the printer actually supports. For example, if the user configures the B&W printer to use a film-size of 14Inx17IN but the maximum film size supported by the printer is 8_5INX11IN, then the printer may reject the images.

2.1.2.4.2.3 SOP Specific Conformance to Basic Grayscale Image Box SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Proposed Presentation Contexts
          - SOP Specific Conformance to Basic Grayscale Image Box SOP Class

Print AE issues the following DIMSE-N commands for the Basic Grayscale Image Box SOP Class:

N-SET

Attribute Name	Tag	Usage	Description	Generated By		Value	
				Usr	Sys	Options	Default
Image Position	(2020, 0010)	M	The position of the image on the media		✓	Always set to 1	
Polarity	(2020, 0020)	U	Polarity of image on media (NORMAL or REVERSE)		✓	NORMAL	
Basic Grayscale Image Sequence Type	(2020, 0110)	M	The image data attributes		✓	Always set (but only for B&W Images.)	
>Samples Per Pixel	(0028, 0002)	M	The number of data samples per pixel		✓	Always set (1)	

Attribute Name	Tag	Usage	Description	Generated By		Value	
				Usr	Sys	Options	Default
>Photometric Interpretation	(0028, 0004)	M	Interpretation of pixel data (MONOCHROME2, PALETTE COLOR, RGB, etc.)		✓	Always set (MONOCHROME2)	
>Rows	(0028, 0010)	M	The number of rows in the image, specified by the value sizeY in the setup dialog.	✓		Always set	
>Columns	(0028, 0011)	M	The number of columns in the image, specified by the value sizeX in the setup dialog.	✓		Always set	
>Bits Allocated	(0028, 0100)	M	Number of bits per pixel allocated		✓	Always set (8)	
>Bits Stored	(0028, 0101)	M	Number of bits per pixel actually stored		✓	Always set (8)	
>High Bit	(0028, 0102)	M	The most-significant-bit in the pixel		✓	Always set (7)	
>Pixel Representation	(0028, 0103)	M	Pixel representation (unsigned – 0 or signed – 1)		✓	Always set (0)	
>Pixel Data	(7FE0, 0010)	M	The pixel data		✓	Always set	

Table 19 Basic Grayscale Image Box Attributes

2.1.2.4.2.4 SOP Specific Conformance to Basic Color Image Box SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Proposed Presentation Contexts
          - SOP Specific Conformance to Basic Color Image Box SOP Class

Print AE issues the following DIMSE-N commands for the Basic Color Image Box SOP Class:
N-SET.

Attribute Name	Tag	Usage	Description	Generated By		Value	
				Usr	Sys	Options	Default
Image Position	(2020, 0010)	M	Same as 2.1.2.4.2.3, SOP Specific Conformance to Basic Grayscale Image Box SOP Class				
Polarity	(2020, 0020)	U	Same as 2.1.2.4.2.3, SOP Specific Conformance to Basic Grayscale Image Box SOP Class				
Basic Color Image Sequence	(2020, 0111)	M	The image data attributes		✓	Always set (but only for Color Images.)	
>Samples Per Pixel	(0028, 0002)	M	The number of data samples per pixel		✓	Always set (3)	
>Photometric Interpretation	(0028, 0004)	M	Interpretation of pixel data (MONOCHROME2, PALETTE COLOR, RGB, etc.)		✓	Always set (RGB)	

Attribute Name	Tag	Usage	Description	Generated By		Value	
				Usr	Sys	Options	Default
>Planar Configuration	(0028 0006)	M	Planar configuration (color-by-pixel = 0 or color-by-plane =1)	✓		Configurable by user in DICOM Setup as either color-by-pixel or color-by-plane.	
>Rows	(0028, 0010)	M	The number of rows in the image, specified by the value sizeY in the setup dialog. Default is 5216	✓		Always set	
>Columns	(0028, 0011)	M	The number of columns in the image, specified by the value sizeX in the setup dialog. Default is 4096	✓		Always set	
>Bits Allocated	(0028, 0100)	M	Number of bits per sample allocated		✓	Always set (8)	
>Bits Stored	(0028, 0101)	M	Number of bits per sample actually stored		✓	Always set (8)	
>High Bit	(0028, 0102)	M	The most-significant-bit in the sample		✓	Always set (7)	
>Pixel Representation	(0028, 0103)	M	Pixel representation (unsigned – 0 or signed – 1)		✓	Always set (0)	
>Pixel Data	(7FE0, 0010)	M	The pixel data		✓	Always set	

Table 20 Basic Color Image Box Attributes

2.1.2.4.2.5 SOP Specific Conformance to Printer SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Printing DICOM studies to a B&W or color printer
        - Proposed Presentation Contexts
          - SOP Specific Conformance to Printer SOP Class

HD11 issues the following DIMSE-N commands for the Printer SOP Class:

N-GET.

Attribute Name	**Tag**	**Usage SCU/SCP**
Printer Status	(2110,0010)	U/M
Printer Status Info	(2110,0020)	U/M

Table 21 Printer Attributes

Note: These printer commands are issued for internal use only. The printer status is never reported back to the user.

2.1.2.5 Obtaining a list of scheduled work from the HIS via Modality Worklists

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Obtaining a list of scheduled work from the HIS via Modality Worklists

HD11 provides Standard Conformance to the following DICOM V3.0 **Worklist Management** SOP Class as an SCU.

SOP Class Name	**SOP Class UID**	**Role**
Modality Worklist Info Model - FIND	1.2.840.10008.5.1.4.31	SCU

Table 22: SOP Class Supported by Worklist Management Service

HD11 requests the transfer of worklists with the DIMSE C-FIND command.

2.1.2.5.1 Associated Real-World Activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Obtaining a list of scheduled work from the HIS via Modality Worklists
        - Associated Real-World Activity

HD11 obtains scheduled worklists from the Modality Worklist Server in two ways; the user can manually request a fresh copy of the desired worklist from the Modality Worklist Server by pressing the Refresh button on the Patient Selection screen, also requests can be made on a polled basis in the background, with a polling interval configured by the user.

If HD11 is not connected to the network, the 'Refresh' button is grayed-out. If HD11 is connected to the network, the 'Refresh' button is enabled; the user can then press it to perform a manual refresh of HD11's worklist: HD11 will first negotiate a C-ECHO with the server to verify that the MWL server is live and if live, perform the C-Find.

Note that if HD11 is not connected to the Modality Worklist Server network, the worklist cached in HD11 may be out-of-date with the worklist maintained by the Modality Worklist Server. Nevertheless, the cached worklist is available for use on portable exams.

When HD11 is reconnected to the network a fresh copy of the current list is requested.

2.1.2.5.2 Proposed Presentation Contexts

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Obtaining a list of scheduled work from the HIS via Modality Worklists
        - Proposed Presentation Contexts

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	UID	Name List	UID List		
Modality Worklist Info Model – FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian (Preferred, see Note)	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		

Table 23: Worklist Management - Presentation Context

Note: If the worklist server accepts both Explicit VR Little Endian and Implicit VR Little Endian then HD11 will use Explicit VR Little Endian as a transfer syntax.

2.1.2.5.2.1 SOP Specific Conformance Statement for the Modality Worklist SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Obtaining a list of scheduled work from the HIS via Modality Worklists
        - Proposed Presentation Contexts
          - SOP Specific Conformance Statement for the Modality Worklist SOP Class

HD11 provides standard conformance to the DICOM Worklist Management Service Class.

Table 24 describes the use of attributes as both Matching Key values in the C-FIND request message, and as Return Keys in the set of C-FIND-RSP messages. The Matching Key Usage follows the DICOM Standard for attribute matching, including Single Value matching and Range matching. For those Matching Keys that are used by HD11, the Attribute Type as defined by DICOM is indicated: Required or Optional. These values indicate the degree to which the MWL SCP must support the attribute as a Matching Key.

Similarly, the Attribute Type of values used as Return Keys is given as defined by DICOM: Type 1 (required), Type 1C (conditionally required), Type 2 (required but may be NULL), Type 2C (conditionally required but may be NULL), or Type 3 (optional).

An empty value in the Matching Key column means that this value is not used as a matching key. An empty value in the Return Key column means that HD11 ignores this value. If an attribute that is non-mandatory to the SCU is not used by HD11 as a matching key and its value as a return key is ignored, the attribute is omitted from the list of attributes.

Attribute Name	Tag	Matching Key Usage	Return Key Usage
SOP Common			
Specific Character Set	(0008,0005)		Ignored by HD11.

Attribute Name	Tag	Matching Key Usage	Return Key Usage
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040, 0100)	Required	Type 1
> Scheduled Station AE Title	(0040, 0001)	Required	Type 1 Set in MPPS.
> Scheduled Procedure Step Start Date	(0040, 0002)	Required	Type 1 Used in Patient Selection screen. Set in MPPS.
> Scheduled Procedure Step Start Time	(0040, 0003)	Required	Type 1 Used in Patient Selection screen. Set in MPPS.
> Modality	(0008, 0060)	Required	Type 1 Set in MPPS.
> Scheduled Performing Physician's Name	(0040, 0006)		Type 2 Sets "Performing Physician's Name" in the MPPS. Note: This is not used to set the 'Performed by' field in the Patient Id screen however it is expected that a future release would set this value.
> Scheduled Procedure Step Description	(0040, 0007)		Type 1C Set in MPPS and images. May be used to set "Description" field on the Patient Selection

Attribute Name	Tag	Matching Key Usage	Return Key Usage
			screen, and "Study Description" in images: 2nd choice, configurable
> Scheduled Procedure Step Location	(0040, 0011)		Type 2 Sets "Location" field on the Patient Selection screen.
> Scheduled Protocol Code Sequence	(0040, 0008)		Type 1C Set as "Scheduled Action Item Code Sequence" and "Performed Action Item Code Sequence" in MPPS, and as "Scheduled Protocol Code Sequence" in images.
>> Code Value	(0008, 0100)		Type 1 Set in MPPS and images.
>> Coding Scheme Designator	(0008, 0102)		Type 1 Set in MPPS and images.
>> Coding Scheme Version	(0008, 0103)		Type 3 If present, set in MPPS and images.
>> Code Meaning	(0008, 0104)		Type 3 If present, set in MPPS and images. May also be used to set "Description" field on the Patient Selection screen, and "Study

Attribute Name	Tag	Matching Key Usage	Return Key Usage
			Description" in images: 3rd choice, configurable
> Scheduled Procedure Step ID	(0040, 0009)		Type 1 Set in MPPS and images.
Requested Procedure			
Requested Procedure ID	(0040, 1001)		Type 1 Set in MPPS and images.
Requested Procedure Description	(0032, 1060)		Type 1C Set in MPPS. May also be used to set "Description" field on the Patient Selection screen, and "Study Description" in images: 1st choice, configurable
Requested Procedure Code Sequence	(0032, 1064)		Type 1C If present, set as "Procedure Code Sequence" in MPPS.
> Code Value	(0008, 0100)		Type 1C Set in MPPS.
> Coding Scheme Designator	(0008, 0102)		Type 1C Set in MPPS.
> Coding Scheme Version	(0008, 0103)		Type 3 If present, set in MPPS.
> Code Meaning	(0008, 0104)		Type 3

Attribute Name	Tag	Matching Key Usage	Return Key Usage
			If present, set in MPPS.
Study Instance UID	(0020, 000D)		Type 1 Set in MPPS and images.
Referenced Study Sequence	(0008, 1110)		Type 2 Set in MPPS and images.
> Referenced SOP Class UID	(0008, 1150)		Type 1C Ignored.
> Referenced SOP Instance UID	(0008, 1155)		Type 1C Set in MPPS and images.
Reason for the Requested Procedure	(0040, 1002)		Type 3 May be used to set "Indication" field on the Patient Selection screen: 1st choice, configurable
Imaging Service Request			
Accession Number	(0008, 0050)		Type 2 Displayed on Patient ID screen. Set in MPPS and images.
Referring Physician's Name	(0008, 0090)		Type 2 Sets "Referring Physician" in the Patient ID screen and the 'Patient Selection' screen.

Attribute Name	Tag	Matching Key Usage	Return Key Usage
Reason for Imaging Service Request	(0040, 2001)		Type 3 May be used to set "Indication" field on the Patient Selection screen: 2nd choice, configurable
Visit Relationship			
Referenced Patient Sequence	(0008, 1120)		Type 2 Set in MPPS.
> Referenced SOP Class UID	(0008, 1150)		Type 2 Ignored.
> Referenced SOP Instance UID Current Patient Location	(0008, 1155) (0038, 0300)		Type 2 Set in MPPS. Type 2 Sets "Location" in field of the Patient Selection screen.
Patient Identification			
Patient Name	(0010, 0010)		Type 1 Displayed on 'Patient ID' screen and 'Patient Selection' screen. Set in MPPS and used as a tag in images.
Patient ID	(0010, 0020)		Type 1 Displayed in "MRN" field

Attribute Name	Tag	Matching Key Usage	Return Key Usage
			of 'Patient ID' screen and 'Patient Selection' screen. Set in MPPS and used as a tag in images.
Other Patient ID	(0010, 1000)		Type 3 Displayed in "Alternate ID Number" field of 'Patient ID' screen and 'Patient IDs' field of 'Patient Selection' screen. Note: If multiple values are present for this attribute, only the first value is taken and used. Used as a tag in images.
Patient Demographic			
Patient's Birth Date	(0010, 0030)		Type 2 Sets the "DOB" field on the Patient ID and Patient Selection screen. Set in MPPS.
Patient's Birth Time	(0010, 0032)		Type 3 Sets the "DOB" field on the Patient ID screen.
Patient's Age	(0010, 1010)		Type 3 Sets the "Age" field on the Patient Selection

Attribute Name	Tag	Matching Key Usage	Return Key Usage
			screen.
Patient Sex	(0010, 0040)		Type 2 Sets the "Gender" field on the 'Patient ID' screen and 'Patient Selection' screen. Set in MPPS.
Patient's Weight	(0010, 1030)		Type 2 Sets the "Weight" field on the 'Patient ID' and 'Patient Selection' screens.
Patient's Size	(0010, 1020)		Type 3 Sets the "Height" field on the 'Patient ID' and 'Patient Selection' screens.

Table 24: Modality Worklist Usage in the Worklist Management service

2.1.2.6 Updating the status of a scheduled procedure

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Updating the status of a scheduled procedure

HD11 provides Standard Conformance to the following DICOM V3.0 Modality Performed Procedure Step (MPPS) SOP Class as an SCU.

SOP Class Name	SOP Class UID	Role
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	SCU

Table 25: SOP Class Supported by MPPS service

The system uses N-CREATE and N-SET commands to notify the MPPS Server whenever the status of a patient's study has changed.

2.1.2.6.1 Associated Real-World Activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Updating the status of a scheduled procedure
        - Associated Real-World Activity

The opening of a study marks the beginning of a new Modality Performed Procedure Step (MPPS). At this time, a MPPS record is created on the MPPS SCP through the use of the N-CREATE service. If the MPPS SCP is unavailable at the time the first image is stored, the request is queued and will be sent when the MPPS SCP is available.

When the user ends the scheduled procedure by closing the study and saving any changes, the MPPS status is "Completed". Alternatively, the user may choose to cancel acquisition, the study is saved in local storage and the MPPS status becomes "Discontinued". At this time, the Study Management AE attempts to modify the MPPS on the MPPS SCP through the use of the N-SET service. If the MPPS SCP is unavailable, the request is queued and will be sent when the MPPS SCP is available..

2.1.2.6.2 Proposed Presentation Contexts

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Updating the status of a scheduled procedure
        - Associated Real-World Activity
          - Proposed Presentation Contexts

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	UID	Name List	UID List		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Explicit VR Little Endian (Preferred, see Note)	1.2.840.10008.1.2.1	SCU	None
		Implicit VR Little Endian	1.2.840.10008.1.2		

Table 26: MPPS - Presentation Context

Note: If the SCP accepts both Explicit VR Little Endian and Implicit VR Little Endian then HD11 will use Explicit VR Little Endian.

2.1.2.6.2.1 SOP Specific Conformance Statement for the MPPS SOP Class

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Initiation by Real-World Activity
      - Updating the status of a scheduled procedure
        - Associated Real-World Activity
          - Proposed Presentation Contexts
            - SOP Specific Conformance Statement for the MPPS SOP Class

HD11 provides standard conformance to the DICOM MPPS Service Class.

The updated attributes are shown in Table 27. The "N_CREATE Usage" column shows the attributes transmitted when the status of the study changes to "IN_PROGRESS". The "N-SET Usage" column shows the attributes transmitted when the status of the study changes to "COMPLETED" or "DISCONTINUED".

Note: The following fields are copied from the selected MWL entry to the Patient ID screen:

Accession Number,
Patient's Name,
Patient's ID,
Patient's Birth Date
Patient's Sex
Referring Physician's Name
Study description

Usually, the performing physician will accept the information in the Patient ID Screen, as is, however the physician has the option of editing the information before starting the study. If the physician edits this information then the MPPS N-CREATE command that is sent to the MPPS server on study start will use the edited information and not the original MWL information.

Attribute Name	Tag	N-CREATE Usage	N-SET Usage
Specific Character Set	(0008, 0005)	Not used, even though some	Not used, even though some

Attribute Name	Tag	N-CREATE Usage	N-SET Usage
		attributes may contain characters from the Latin 1 character set	attributes may contain characters from the Latin 1 character set
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040, 0270)	Present	Not allowed
> Study Instance UID	(0020, 000D)	If available from the MWL; else synthesized by the host imaging system	Not allowed
> Referenced Study Sequence	(0008, 1110)	If present in MWL else NULL	Not allowed
>> Referenced SOP Class UID	(0008, 1150)	Detached Study Mgmt SOP Class: 1.2.840.10008.3.1.2.3.1	Not allowed
>> Referenced SOP Instance UID	(0008, 1155)	From the MWL, if present; else the SOP Instance UID of this study.	Not allowed
> Accession Number	(0008, 0050)	From the "Accession number" field of the Patient ID screen	Not allowed
> Requested Procedure ID	(0040, 1001)	If available from the MWL; else NULL	Not allowed
> Requested Procedure Description	(0032, 1060)	If available from the MWL; else NULL	Not allowed
> Scheduled Procedure Step ID	(0040, 0009)	If available from the MWL; else NULL	Not allowed
> Scheduled Procedure Step Description	(0040, 0007)	If available from the MWL; else NULL	Not allowed
> Scheduled Protocol Code Sequence	(0040, 0008)	If available from the MWL; else NULL	Not allowed
>> Code Value	(0008, 0100)	From the MWL	Not allowed
>> Coding Scheme Designator	(0008, 0102)	From the MWL	Not allowed

Attribute Name	Tag	N-CREATE Usage	N-SET Usage
>> Coding Scheme Version	(0008, 0103)	From the MWL	Not allowed
>> Code Meaning	(0008, 0104)	From the MWL	Not allowed
Patient Name	(0010, 0010)	Generated from the "Name" fields of the Patient ID screen	Not allowed
Patient ID	(0010, 0020)	From the "MRN" field of the Patient ID screen	Not allowed
Patient's Birth Date	(0010, 0030)	From the "Birth Date" field of the Patient ID screen	Not allowed
Patient Sex	(0010, 0040)	From the "Gender" field of the Patient ID screen	Not allowed
Referenced Patient Sequence	(0008, 1120)	If available from the MWL; else NULL	Not allowed
> Referenced SOP Class UID	(0008, 1150)	Detached Patient Mgmt SOP Class UID 1.2.840.10008.3.1.2.1.1	Not allowed
> Referenced SOP Instance UID	(0008, 1155)	If available from the MWL; else NULL	Not allowed
Performed Procedure Step Information			
Performed Procedure Step ID	(0040, 0253)	If available from the MWL, else generated by HD11	Not allowed
Performed Station AE Title	(0040, 0241)	AE Title of HD11	Not allowed
Performed Station Name	(0040, 0242)	Same as the 'Performed Station AE Title', tag (0040,0241)	Not allowed
Performed Location	(0040, 0243)	If available from the MWL, else NULL	Not allowed
Performed Procedure Step Start Date	(0040, 0244)	Date of the acquisition of the first image in the study	Not allowed

Attribute Name	Tag	N-CREATE Usage	N-SET Usage
Performed Procedure Step Start Time	(0040, 0245)	Time of the acquisition of the first image in the study	Not allowed
Performed Procedure Step Status	(0040, 0252)	"IN PROGRESS"	"COMPLETED" or "DISCONTINUED"
Performed Procedure Step Description	(0040, 0254)	If "Scheduled Procedure Description" available from MWL, else "Indication" field from Patient ID screen	Not used
Performed Procedure Type Description	(0040, 0255)	If "Scheduled Procedure Description" available from MWL, else "Indication" field from Patient ID screen	Not used
Procedure Code Sequence	(0008, 1032)	If "Requested Procedure Code Sequence" available from the MWL; else generated by HD11	If "Requested Procedure Code Sequence" available from the MWL; else NULL
> Code Value	(0008, 0100)	From the MWL	From the MWL
> Coding Scheme Designator	(0008, 0102)	From the MWL	From the MWL
> Coding Scheme Version	(0008, 0103)	If available from the MWL; else omitted	If available from the MWL; else omitted
> Code Meaning	(0008, 0104)	If available from the MWL; else omitted	If available from the MWL; else omitted
Performed Procedure Step End Date	(0040, 0250)	NULL (empty string sent)	Date "End Study" is pressed.
Performed Procedure Step End Time	(0040, 0251)	NULL (empty string sent)	Time "End Study" is pressed.
Image Acquisition Results			

Attribute Name	Tag	N-CREATE Usage	N-SET Usage
Modality	(0008, 0060)	"US"	Not allowed
Study ID	(0020, 0010)	If MWL is used, set to "Requested Procedure ID" if available from the MWL; else the empty string. This "DICOM Study ID" differs from the value of "Study ID" in DICOM images.	Not allowed
Performed Protocol Code Sequence	(0040, 0260)	If "Scheduled Protocol Code Sequence" available from the MWL; else NULL	If "Scheduled Protocol Code Sequence" available from the MWL; else NULL
> Code Value	(0008, 0100)	From the MWL	From the MWL
> Coding Scheme Designator	(0008, 0102)	From the MWL	From the MWL
> Coding Scheme Version	(0008, 0103)	If available from the MWL; else omitted	If available from the MWL; else omitted
> Code Meaning	(0008, 0104)	If available from the MWL; else omitted	If available from the MWL; else omitted
Performed Series Sequence	(0040, 0340)	One item representing the series used for this MPPS	One item representing the series used for this MPPS
> Performing Physician's Name	(0008, 1050)	From the "Performed By" field of the Patient ID screen	From the "Performed By" field of the Patient ID screen
> Protocol Name	(0018, 1030)	"CLR Standard" for all exams.	"CLR Standard" for all exams.
> Operator's Name	(0008, 1070)	From the "Performed By" field of the Patient ID screen; else NULL	From the "Performed By" field of the Patient ID screen; else NULL

Attribute Name	Tag	N-CREATE Usage	N-SET Usage
> Series Instance UID	(0020, 000E)	Synthesized by HD11	Synthesized by HD11
> Series Description	(0008, 103E)	NULL	NULL
> Retrieve AE Title	(0008, 0054)	NULL	NULL
> Referenced Image Sequence	(0008, 1140)	NULL	NULL
> Referenced Non-image Composite SOP Instance Sequence	(0040, 0220)	NULL	NULL

Table 27: Modality Performed Procedure Step N-CREATE and N-SET Attributes

2.1.3 Association Acceptance Policy

2.1.3.1 Responding to a verification request from a remote DICOM server

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Acceptance Policy
      - Responding to a verification request from a remote DICOM server

HD11 provides standard conformance to the DICOM V3.0 SOP Class as shown in the Table below.

SOP Class Name	SOP Class UID	Role
Verification SOP Class	1.2.840.10008.1.1	SCP

Table 28: SOP Class Supported by Verification service

2.1.3.1.1 Associated Real-World Activity

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Acceptance Policy
      - Responding to a verification request from a remote DICOM server
        - Associated Real-World Activity

The ultrasound system employs a Verification SCP to reply to verification requests sent by remote devices. This will allow the remote device to ensure the availability of HD11 on the network, within the constraints of the network topology, and timeout values.

HD11 employs a 'high security' paradigm and will only respond to C-Echo requests from DICOM Servers that it knows about. Specifically, the following steps must have been performed:

1. In DICOM Setup, add the DICOM server to the list of DICOM servers.
2. Assign the server to the appropriate role.

Accepted Presentation Contexts

Context: Expansion of Headings and sub-headings

- Application Entity Specifications
  - HD11 AE Specification
    - Association Acceptance Policy
      - Responding to a verification request from a remote DICOM server
        - Accepted Presentation Contexts

Only one association is established for each verification attempt. When the association is opened, the presentation contexts noted in Table 29 are accepted.

Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Implicit VR Little Endian	1.2.840.10008.1.2		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Table 29: Accepted Presentation Contexts

3. HD11 as a Media Storage Application

The implementation model, application data flow diagram, functional definition of the HD11 AE, sequencing of real world activities are the same as in section 2.

3.1 File Meta Information for the HD11 AE

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - File Meta Information for the HD11 AE

Element	Implementation Value
Implementation Class UID	1.2.840.113543.6.6.4.1
Implementation Version Name	HD11_V1.1

Table 30: Implementation Identifying Information

3.2 Real-World Activities

3.2.1 Saving a DICOM Study to removable media

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Saving a DICOM Study to removable media

The HD11 AE conforms to the Application Profile for Ultrasound Media Storage applications. HD11 supports the SOP classes described in the Application Profiles. For all SOP Classes, this AE performs in the role of File Set Creator (FSC) and File Set Updater (FSU). The particular physical media available is 3.5" MOD, CD-R or CD-RW. For previously imported studies, HD11 will export the IODs using the transfer syntax and tags that were used when HD11 originally imported the study. (HD11 does not import SR when a study is imported.)

Supported Application Profile	**Real-World Activity**	**Roles**	**Service Class Option**
STD-US-SC-SF&MF	Export Study	FSC and FSU	Interchange
STD-US-ID-SF&MF	Export Study	FSC and FSU	Interchange

Table 31: Media Storage Application Profiles

The Export DICOM Objects Application Entity acts as FSC and FSU using the Interchange Option.

When saving a DICOM study to removable media, the user can specify the photometric interpretation and transfer syntax used to create DICOM files for images on the media. The options available to users are listed in Table 32. DICOM file for SR is always created using Implicit VR Little Endian format.

Transfer Syntax and Photometric Interpretation options for removable media
Uncompressed (DICOM Implicit VR Little Endian) Palette Color
Uncompressed (DICOM Explicit VR Little Endian) Palette Color
Uncompressed (DICOM Implicit VR Little Endian) RGB
Uncompressed (DICOM Explicit VR Little Endian) RGB
RLE (lossless) Compression Palette Color
RLE (lossless) Compression RGB
JPEG (lossy) Compression YBR

Table 32: Photometric Interpretation and Transfer Syntax Options for Saving to Removable Media

Note on Panview datasets

HD11 creates special PanView internal files called 'dataset' files that are never exported to a PACS but may be optionally exported to media. These DICOM files are not exported in network storage since they are only of use to HD11's PanView application and HD11 does not support networked Query/Retrieve. However, these files may optionally be exported to media with the rest of the study for archival purposes. The study could later be imported into an HD11 system and the user would be able to click on the dataset file to enter into the PanView application.

Panview datasets, exported to media, have the same public attributes as Panview images exported across the network to a DICOM PACS (Storage SCP), other than the following attributes:

Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Value**
Rows	0028, 0010	1	US	Number of rows in the image.	The image dimensions of PanView datasets are not fixed. The number of rows and columns in a PanView dataset image varies based on the characteristics of the PanView image acquisition.
Columns	0028, 0011	1	US	Number of columns in the image	

3.2.2 Reading a DICOM study from removable media

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media

When requested to read the media directory, the HD11 Application Entity acts as FSR using the Interchange Option,

The user choosing the Import operation from a menu initiates importing images. See the system user manuals for a description of the specific user interface capabilities. HD11 doesn't support FSR role for DICOM SR.

The HD11 AE conforms to the Application Profile for Ultrasound Media Storage applications. For all SOP Classes described in the Application Profile, this AE performs in the role of File Set Reader (FSR). The particular physical media available is 3.5" MOD, CD-R or CD-RW. Image Display and Spatial Calibration of Single and Multi-Frame image objects on any media in the Ultrasound Application Profile is therefore supported.

Supported Application Profile	**Real-World Activity**	**Roles**	**Service Class Option**
STD-US-SC-SF&MF-MOD128	Import Studies	FSR	Interchange
STD-US-SC-SF&MF-MOD230	Import Studies	FSR	Interchange
STD-US-SC-SF&MF-MOD540	Import Studies	FSR	Interchange
STD-US-SC-SF&MF-MOD640	Import Studies	FSR	Interchange
STD-US-SC-SF&MF-MOD13	Import Studies	FSR	Interchange
STD-US-SC-SF&MF-CDR	Import Studies	FSR	Interchange

Table 33: Media Import Application Profiles

HD11's DICOM Study Import feature is designed for importing studies that *were originally exported from* **HD11 (or EnVisor).** The system will not allow the user to import ultrasound studies created by another manufacturers system.

3.2.2.1 SOP Specific Conformance For "Media Storage Directory Storage" SOP Class

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - SOP Specific Conformance For "Media Storage Directory Storage"

HD11 uses this SOP class for Media export as well as Media import. Since HD11 doesn't support import of SR, some of the attributes are not used during import. The 'usage' column explains these attributes.

Type 1, 1C, 2, and 2C data elements present in the Basic Directory Object are supported as required in DICOM 3.0, Parts 3 and 10. They are used for properly navigating through the directory data structures, recognizing and conforming to the character set being used, and the Import Study user interface to aid in the selection of objects to import. Data elements that elicit behavior that is specific to the Application Entity are described in the sections below. If Type 2 data elements are null or if Type 3 data elements are absent, the data elements are ignored by the system and the corresponding display fields in the user interface screen(s) are left blank.

3.2.2.2 File-Set Identification Module

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - File-Set Identification Module

Contents of the File-set Identification Module are not displayed or otherwise used in this version of HD11.

3.2.2.3 Directory Information Module

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - Directory Information Module

All data elements are used as described in DICOM 3.0 Part 3 for Basic Directory Object Definitions. As stated in the Ultrasound Application Profile, "The (DICOMDIR) Directory shall include Directory Records of PATIENT, STUDY, SERIES, and IMAGE corresponding to the information object files in the File-set". Given this requirement, HD11 uses these directory records to identify the study to import. If there are DICOM image files on the import media that do not appear in the DICOMDIR Directory Information Module (either because references to these files were omitted or because the Directory Information Module, optional in DICOM but required in the Ultrasound Application Profile, does not exist), these files are not recognized by the system.

HD11 ignores directory Record Types other than those above.

HD11 also ignores the "File-set consistency Flag" (0004, 1212).

3.2.2.3.1 Patient Directory Record

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - Directory Information Module
        - Patient Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008, 0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section A.7 for details.
Patient Name	(0010, 0010)	2	Displayed to help the user identify the patient folder in which to place the studies for this patient.
Patient ID	(0010, 0020)	1	Displayed to help the user identify the patient folder in which to place the studies for this patient.

Table 34: Specific Usage of Patient Directory Record Information

3.2.2.3.2 Study Directory Record

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - Directory Information Module
        - Study Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008, 0005)	1C	The Default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section A.7 for details.
Study Date	(0008, 0020)	1	Used in displaying list of studies to user
Study Time	(0008, 0030)	1	Used in displaying list of studies to user
Accession Number	(0008, 0050)	2	Stored in the system database
Study Description	(0008, 1030)	2	Generated
Study Instance UID	(0020, 000D)	1C	Stored in the system database
Study ID	(0020, 0010)	1	Stored in the system database

Table 35: Specific Usage of Study Directory Record Information

3.2.2.3.2.1 Series Directory Record

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - Directory Information Module
        - Series Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008, 0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section A.7 for details.
Modality	(0008, 0060)	1	Only US is supported. Other modalities are ignored.
Series Description	(0008, 103E)	3	Stored
Series Number	(0020, 0011)	1	Stored

Table 36: Specific Usage of Series Directory Record Information

3.2.2.3.2.2 Image Directory Record

Context: Expansion of Headings and sub-headings

- HD11 as a Media Storage Application
  - Real-World Activities
    - Reading a DICOM study from removable media
      - Directory Information Module
        - Image Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008, 0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section A.7 for details.
Referenced File ID	(0004, 1500)	1C	Used
Referenced SOP Class UID in File	(0004, 1510)	1C	Used
Referenced SOP UID in File	(0004, 1511)	1C	Used
Referenced Transfer Syntax UID in File	(0004, 1512)	1C	Used
Image Date	(0008, 0023)	3	Used for ordering the thumbnail display. On Export, comes from the image.
Image Time	(0008, 0033)	3	Used for ordering the thumbnail display. On Export, comes from the image.

Table 37: Specific Usage of Image Directory Record Information

4. Communications Profiles

HD11 provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

5. Extensions/Specializations/Privatizations

5.1 General

Context: Expansion of Headings and sub-headings

- Extensions/Specializations/Privatizations
  - General

The following private tag is used by HD11 to indicate a private group:

Tag	VR	Value
0031, 0060	LO	"Eclispe 60"

The following private tag is used by HD11's display compensation application:

Tag	VR	Value
0031, 6030	UL	Private data

The following private tag is used by HD11 as part of the algorithm that determines when to add the pixel spacing tag:

Tag	VR	Value
0031, 6031	UL	Private data

The following private tags are used by HD11 as part of the algorithm that determines when the image can be opened by the QLAB application:

Tag	VR	Value
0031, 6032	LO	Private data
0031, 6033	UL	Private data

5.2 2D

Context: Expansion of Headings and sub-headings

- Extensions/Specializations/Privatizations
  - 2D

The Pixel Spacing tag is added to the exported DICOM file when the user has configured this tag to be included and the image is either a 2D only image or a 2D dual image with the same calibration for both images:

					Generated by		
Attribute Name	**Tag**	**Type**	**VR**	**Description**	**Usr**	**Sys**	**Value**
Pixel Spacing	0028, 0030	1	DS	Physical distance in the patient between the center of each pixel, specified by a numeric pair – adjacent row spacing (delimiter) adjacent column spacing (in mm).		✓	Adjacent row spacing \ Adjacent column spacing (in mm)

5.3 PanView

Context: Expansion of Headings and sub-headings

- Extensions/Specializations/Privatizations
  - PanView

PanView image files contain the following private tags for use by HD11's PanView application:

Tag	VR	Value
7777, 0010	LO	Private data
7777, 1001	DA	Private data
7777, 1002	CS	Private data
7777, 1003	LO	Private data
7777, 1014	LT	Private data

5.4 Off-cart QLAB

QLAB is a stand-alone software product that provides advanced off-line ultrasound quantification capabilities. The user can use QLAB to review and quantify HD11 images. The HD11 user an export images in DICOM format to media in order to 'sneaker-net' those images to a PC running the QLAB software. QLAB 4.0 will be the first release to support all HD11 DICOM image formats. Later versions of QLAB may also be a DICOM Storage SCP so the user can network export studies to stand-alone QLAB.

Parts of QLAB, such as 3D, strain quantification, parametric quantification, and intima media thickness, require additional information that can only be encoded in DICOM private tags. The following private tags are used by HD11 to support the QLAB application:

Note: Not all private tags are used all the time,

DICOM Tag	VR	Value
0029,0060	LO	Private data

DICOM Tag	VR	Value
0029,6050	CS	Private data

DICOM Tag	VR	Value
0029,6051	UL	Private data
0029,6052	UL	Private data
0029,6053	DS	Private data
0029,6054	UL	Private data
0029,6055	FL	Private data
0029,6056	US	Private data
0029,6030	UL	Private data
0029,6031	UL	Private data
0029,6032	UL	Private data
0029,6033	DS	Private data
0029,6034	DS	Private data
0029,6036	SL	Private data
0029,6040	CS	Private data
200d,0030	LO	Private data
200d,0031	LO	Private data
200d,0032	LO	Private data
200d,0033	LO	Private data
200d,0034	LO	Private data
200d,0035	LO	Private data
200d,0036	LO	Private data
200d,0037	LO	Private data
200d,0038	LO	Private data
200d,0039	LO	Private data
200d,003a	LO	Private data
200d,3001	LO	Private data
200d,300b	OB	Private data
200d,3012	OB	Private data
200d,3101	LO	Private data
200d,3102	LO	Private data
200d,3103	LO	Private data
200d,3104	LO	Private data
200d,3105	LO	Private data
200d,3106	LO	Private data

DICOM Tag	VR	Value
200d,3107	LO	Private data
200d,3108	LO	Private data
200d,3201	LO	Private data
200d,3202	LO	Private data
200d,3203	LO	Private data
200d,3204	LO	Private data
200d,3205	LO	Private data
200d,3301	LO	Private data
200d,3302	LO	Private data
200d,3303	LO	Private data
200d,3304	LO	Private data
200d,3305	LO	Private data
200d,3306	LO	Private data
200d,3307	LO	Private data
200d,3308	LO	Private data
200d,3309	LO	Private data
200d,330a	IS	Private data
200d,3404	IS	Private data
200d,3405	IS	Private data
200d,3406	FD	Private data
200d,3407	FD	Private data
200d,3408	IS	Private data
200d,3409	IS	Private data
200d,340a	IS	Private data
200d,340b	IS	Private data
200d,340c	IS	Private data
200d,340d	UL	Private data
200d,340e	IS	Private data
200d,340f	IS	Private data
200d,3410	UL	Private data
200d,3a10	IS	Private data
200d,3a11	IS	Private data
200d,3a1a	IS	Private data

DICOM Tag	VR	Value
200d,3a1b	IS	Private data
200d,3a27	FD	Private data
200d,3a28	FD	Private data
200d,3a32	FD	Private data
200d,3a50	CS	Private data
200d,3a51	CS	Private data
200d,3a52	FD	Private data
200d,3a53	CS	Private data
200d,3a54	CS	Private data

DICOM Tag	VR	Value
200d,3a55	FD	Private data
200d,3a56	FD	Private data
200d,3a57	FD	Private data
200d,3a58	IS	Private data
200d,3a59	FD	Private data
200d,3a5a	FD	Private data
200d,3a5d	CS	Private data
200d,3a5e	CS	Private data
200d,3aff	IS	Private data

6. Configuration

The DICOM setup screen allows the user to configure a significant number of options including:

- For the HD11 system, it's AE Title and Port number.
- For DICOM servers, their AE Title, port number, IP address.
- For Storage SCP's and for media storage, the image format.
- For DICOM Printers, many DICOM configuration settings
- For a MWL server, the query parameters: scheduled procedure start range, modality, AE Title.

HD11 also supports on cart QLAB where the user can perform QLAB quantification on the HD11 system of images acquired by the system.

7. Support for Extended Character Sets

HD11 will offer support for Japanese, Chinese, and Russian. This includes translating system text into these languages and allowing the user to input Japanese, Chinese, and Cyrillic characters into the system. One important aspect of this is that the user will be able to enter these special characters into the Patient ID screen.

The present DICOM standard allows Code Extension Techniques for multi-byte characters. Therefore, as well as the default character set (ISO-IR 6), HD11 supports the following extended character sets:

- ISO-IR 100 — Latin Alphabet No. 1
- ISO-IR 87 — Japanese Kanji (ideographic), Hiragana (phonetic) and Katakana (phonetic)
- ISO-IR 13 — Japanese Katakana (phonetic)
- ISO-IR 159 — Supplementary Kanji (ideographic)
- ISO-IR 144 — Russian Cyrillic

Important Note:

When an Application Entity which, does not support Code Extension Techniques, receives a Data Set, which includes multi-byte characters from an HD11 system, misrepresentation of characters may occur.

The DICOM standard states that it is the responsibility of the Application Entity, which receives the Data Sets to take whatever action is considered necessary to minimize the effect of misrepresented characters. It is not the responsibility of the HD11 system to take such action.

7.1 Support for Russian and Japanese Markets

HD11 uses "Code-extension techniques" to encode Japanese stroke based characters and Russian Cyrillic characters in DICOM tags with value representations of SH, LO, ST, LT, UT, and PN.

The technique requires two things in a DICOM file that contains these characters:

1. Add the Optional Specific Character Set TAG (0008,0005) and set the value to the list of identifiers for all the non-standard character sets that will appear in any string in the file separated by backslashes. For example:

   For Japanese systems:
   (0008,0005) = "ISO 2022 IR 13\ISO 2022 IR 87\ISO 2022 IR 159\ISO 2022 IR 100"

   For Russian systems:
   (0008,0005) = "ISO 2022 IR 144\ISO 2022 IR 100"

   For English systems:
   (0008,0005) = "ISO 2022 IR 100"

2. Embed escape sequences in the strings that contain Asian or Cyrillic characters to cause the DICOM interpreting code to switch from one character set to another.

The escape sequences to be used are defined as:

"<ESC>$B"	ISO - IR 87 Japanese Kanji (ideographic), Hiragana (phonetic), Katakana (phonetic)
"<ESC>(B"	ISO - IR 6 ASCII - DICOM default character set
"<ESC>$(D"	ISO - IR 159 Supplementary Kanji (ideographic)
"<ESC>(J"	ISO - IR 144 Russian Cyrillic

7.2 Additional Support for Japanese Markets

Japanese markets will have additional fields to the Patient ID screen so that the user can enter the Roman, Ideographic, and Phonetic representations of a patient's name.
The DICOM patient name field, tag (0010,0010) of type PN, is a single string field that contains up to five components (last, first, middle, title, honorific) in up to three language variants (Roman, Idiographic, and Phonetic.) The format of the patient name field is:

> "Roman-last^Roman-first^Roman-middle^Roman-prefix^Roman-suffix=
> Ideographic-last^Ideographic-first^Ideographic-middle^Ideographic-prefix^Ideographic-suffix=
> Phonetic-last^Phonetic-first^Phonetic-middle^Phonetic-prefix^Phonetic-suffix"

In the above string the five components are separated with the '^' Ascii character and the three language variants are separated by the '=' Ascii character. The only required

component is the Roman Last name. All other components are optional. Trailing '^' and '=' characters can be excluded.

When this string is encoded in a DICOM image file or DICOMDIR directory file, the escape sequences appropriate for the character sets used are inserted into the string for storage as a single-byte string. On media import the escape sequences are removed.

7.3 Support for Chinese Markets

The current DICOM standard as of this release of HD11 does not support Chinese character sets. HD11 however provides support for Chinese customers so that they can enter text using Chinese characters.

If the system is set up for Chinese, then (unlike for Japanese markets) the user can enter just one version of the patient name. This would make Chinese systems work in the same way as Russian, English, French, Italian, and Spanish systems. The Chinese user will be able to enter the patient name using a combination of Chinese and Roman characters – all of the characters will appear wherever the system displays the patient name (image, report, Search for Study window, etc.).

Since the DICOM Standard does not offer support for Chinese characters, all Chinese characters entered into the Patient ID screen will be lost if a user exports or backs up a study to media. This will be noticed when the study is imported back into the system; upon import, each Chinese character will be replaced with a question mark ("?") character. The question marks will make it obvious to the user that the characters were lost.

If the user enters a patient name that consists entirely of Chinese characters, then the name will come back as "??????". In this case, the user will have to identify the study in the "Import Study" and "Search for Study" windows by the MRN. If the user enters a patient name that consists of a combination of Roman and Chinese characters, then Roman characters will be preserved, and the name will come back as something like "Lee ????????". This will give users who like to back up their studies the flexibility of entering a patient name with a combination of Roman and Chinese characters, and have at least part of the name come back during import.

Note that the original Chinese name will be "burned into" study images that are exported to media. These Chinese characters will remain on the images when the studies are imported back into the system.

A. Appendix – Structured Report Templates

Note that all the concepts defined privately by Philips have the CSD value as '99PMSBLUS'.

A.1 OB – GYN structured report template

HD11 implements the OB-GYN template (TID 5000) from the DICOM standard, part 16. This appendix describes the scope and manner that HD11 measurements appear in DICOM SR.

Measurements and calculations performed for Obstetric and Gynecology studies will lead to creation of "OB-GYN Ultrasound Procedure Report" structured report document. Measurements can be performed by pressing the 'Calc' key on HD11 control panel. Measurements and calculations available in the menu can be configured through the setup application. It is also possible to configure the measurement unit (Metric or U.S).

All concepts with value type (VT) NUM will always have a 'MeasurementUnitCodeSequence' that specifies the unit of the measurement. The CSD for all units will be UCUM (Unified Code for Units) and CV and CM will be based on application configuration and will confirm to UCUM standards.

A.2.2 Template specific conformance for TID 5000

The template for the root of the content tree for TID 5000 and its use in the HD11 context is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (125000, DCM, "OB-GYN Ultrasound Procedure Report")	✓	This is the root 'CONTAINER'

2	>	HAS CONCEPT MOD	INCLUDE	DTID (1204) Language of Content Item and Descendants	x	This module is not used in HD11 at present.
3	>	HAS OBS CONTEXT	INCLUDE	DTID (1001) Observation Context	x	Although DICOM specifies this as a mandatory section, none of the attributes under DTID 1001 are mandatory.
4	>	CONTAINS	INCLUDE	DTID (5001) Patient Characteristics	✓	Refer to 1.A.2.2.1 for HD11 usage of this.
5	>	CONTAINS	CONTAINER	DT (111028, DCM, "Image Library")	✓	Contains list of 'IMAGE' items on which the measurements have been performed. Subsequent measurement concept content items refer to these IMAGE items using INFERRED FROM relationship.
6	>>	CONTAINS	IMAGE	No purpose of reference	✓	One or more 'IMAGE' items on which the measurements have been performed.
7	>	CONTAINS	INCLUDE	DTID (5002) OB-GYN Procedure Summary Section	✓	Refer to 1.A.2.2.2 for HD11 usage of this.
8	>	CONTAINS	INCLUDE	DTID (5004) Fetal Biometry Ratio Section	✓	Concepts in CID 12004 will be used, refer to 1.A.2.2.3 for HD11 usage of this.
9	>	CONTAINS	INCLUDE	DTID (5005) Fetal Biometry Section	✓	Concepts in CID 12005 will be used, refer to 1.A.2.2.4 for HD11 usage of this.

10	>	CONTAINS	INCLUDE	DTID (5006) Long Bones Section	✓	Concepts in CID 12006 will be used, refer to 1.A.2.2.5 for HD11 usage of this.
11	>	CONTAINS	INCLUDE	DTID (5007) Fetal Cranium Section	✓	Concepts in CID 12007 will be used, refer to 1.A.2.2.6 for HD11 usage of this.
12	>	CONTAINS	INCLUDE	DTID (5009) Biophysical Profile Section	✓	Refer to 1.A.2.2.7 for HD11 usage of this.
13	>	CONTAINS	INCLUDE	DTID (5011) Early Gestation Section	✓	Concepts in CID 12009 will be used, refer to 1.A.2.2.8 for HD11 usage of this.
14	>	CONTAINS	INCLUDE	DTID (5010) Amniotic Sac Section	✓	Concepts in CID 12008 will be used, refer to 1.A.2.2.9 for HD11 usage of this.
15	>	CONTAINS	INCLUDE	DTID (5015) Pelvis and Uterus Section	✓	Concepts in CID 12011 will be used, refer to 1.A.2.2.10 for HD11 usage of this.
16	>	CONTAINS	INCLUDE	DTID (5012) Ovaries Section	✓	Refer to 1.A.2.2.11 for HD11 usage of this.
17	>	CONTAINS	INCLUDE	DTID (5013) Follicles Section	✓	This section is used with concept modifier Laterality = Left. Refer to 1.A.2.2.12 for HD11 usage of this.
18	>	CONTAINS	INCLUDE	DTID (5013) Follicles Section	✓	This section is used with concept modifier Laterality = Right. Refer to 1.A.2.2.12 for HD11 usage of this.

19	>	CONTAINS	CONTAINER	EV (121070, DCM, "Findings")	✓	This section (row 19, 20, and 21) is used to include fetus vascular measurements. Refer to section A.2.2.13 for details. Measurements from DCID (12141), 'Fetal Vasculature' are used.
20	>>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	✓	EV (T-F6800, SRT, "Embryonic Vascular Structure")
21	>>	CONTAINS	INCLUDE	DTID (5025) OB-GYN Fetal Vascular Measurement Group)	✓	$AnatomyGroup = DCID (12141) Fetal Vasculature). Refer to section A.2.2.13 for details of TID 5025.
22	>	CONTAINS	CONTAINER	EV (121070, DCM, "Findings")	✓	This section (row 22, 23, and 24) is used to include pelvic vascular measurements. Refer to section A.2.2.14 for details. Measurements from DCID (12140), 'Fetal Vasculature' are used.
23	>>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	✓	EV (T-D6007, SRT, "Pelvic Vascular Structure")
24	>>	CONTAINS	INCLUDE	DTID (5026) OB-GYN Pelvic Vascular Measurement Group)	✓	$AnatomyGroup = DCID (12140) Pelvic Vasculature Anatomical Location. Refer to section A.2.2.14 for details of TID 5026.

A.2.2.1 OB-GYN Patient Characteristics (TID 5001)

Use of the template TID 5001 in the context of HD11 is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (121118, DCM, "Patient Characteristics")	✓	
2	>	CONTAINS	NUM	EV (8302-2, LN, "Patient Height")	✓	Value is taken from PDE (Patient Data Entry) screen or from the MWL.
3	>	CONTAINS	NUM	EV (29463-7, LN, "Patient Weight")	✓	Value is taken from PDE (Patient Data Entry) screen or from the MWL.
4	>	CONTAINS	NUM	EV (11996-6, LN, "Gravida")	✓	Value is taken from PDE (Patient Data Entry) screen.
5	>	CONTAINS	NUM	EV (11977-6, LN, "Para")	✓	Value is taken from PDE (Patient Data Entry) screen.
6	>	CONTAINS	NUM	EV (11612-9, LN, "Aborta")	✓	Value is taken from PDE (Patient Data Entry) screen.
7	>	CONTAINS	NUM	EV (33065-4, LN, "Ectopic Pregnancies")	✓	Value is taken from PDE (Patient Data Entry) screen.

A.2.2.2 OB-GYN Procedure Summary (TID 5002)

The following table describes the use of this template in the context of HD11.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments

1			CONTAINER	DT (121111, DCM, "Summary")	✓	
2	>	CONTAINS	DATE	(11955-2, LN, "LMP")	✓	Value is taken from PDE (Patient Data Entry) screen. -- Row 2, 3 and 4 are concepts from DCID 12003, "OB-GYN Dates"
3	>	CONTAINS	DATE	(11779-6, LN, "EDD from LMP")	✓	Value automatically calculated by the HD11 system based on the value entered for LMP.
4	>	CONTAINS	DATE	(11781-2, LN, "EDD from average ultrasound age")	✓	Value automatically calculated by the HD11 system based various measurements and on the LMP. If there is more than one fetus, the value used is the earliest calculated EDD amongst all fetuses.
5	>	CONTAINS	NUM	(11878-6, LN, "Number of Fetuses")	✓	Value is taken from PDE (Patient Data Entry) screen. -- This value is actually inserted as invocation of TID 300 (Measurement) with concept(s) from DCID 12001, "OB-GYN summary" passed as parameters.
6	>	CONTAINS	INCLUDE	"OB-GYN Fetus Summary" (BTID 5003)	✓	Refer to section 1.A.2.2.2.1 for details of HD11 usage of this. This template is included 1 per fetus.

A.2.2.2.1 OB-GYN Fetus Summary (TID 5003)

HD11 uses this template to insert measurements from DCID 12019. HD11 uses a private extension to DCID 12019 to define a new Fetus Summary measurement concept for 'Peak-to-Peak time interval over two beats'.

Following table shows the extension to Fetus Summary (CID 12019) used by HD11.

CSD	CV	CM
99PMSBLUS	C12019-01	Peak-to-Peak time interval over two beats

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (125008, DCM, "Fetus Summary")	✓	
2	>	HAS OBS CONTEXT	TEXT	EV (11951-1,LN, "Fetus ID")	✓	Value of "1", "2", "3" or "4" is used as identifier of the Fetus. -- This value is actually inserted as invocation of TID 1008 (Subject context - Fetus) -- This is present only if the study has more than one fetus.

3	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	✓	This field contains all observations, findings (only the Finding text value preceded by the Finding Group Name) and the comments entered in the reporting screen on the HD11. In case of multiple fetuses, these observations are associated with the selected Fetus ID. For the Anatomy Visualized finding, a string 'Seen' will be displayed against the anatomy if the check box against the particular anatomy is checked in the reporting screen. A string 'Not Seen' will be displayed against the anatomy if the check box against the particular anatomy is not checked in the reporting screen.
4	>	CONTAINS	NUM	(11888-5, LN, "Composite Ultrasound Age")	✓	This is a system-calculated value. -- This value is inserted as invocation of TID 300 (Measurement) with concepts from DCID 12019
5	>	CONTAINS	NUM	(11885-1, LN, "Gestational Age by LMP")	✓	This is a system-calculated value. -- This value is inserted as invocation of TID 300 (Measurement) with concepts from DCID 12019

6	>	CONTAINS	NUM	(11727-5, LN, "Estimated Weight")	✓	This is a system-calculated value. -- This value is inserted as invocation of TID 300 (Measurement) with concepts from DCID 12019
7	>>	HAS CONCEPT MOD	CODE	Equation or Table	✓	Concepts from CID 12014, OB Body Fetal Weight Equations and Tables will be used. Refer to section A.2.2.16 for concepts used in HD11.
8	>	CONTAINS	NUM	(99PMSBLUS, C12019-01, Peak-to-Peak time interval over two beats)	✓	This value is inserted as invocation of TID 300 (Measurement) with concepts from DCID 12019. This concept is an extension of DCID 12019.

A.2.2.3 Fetal Biometry Ratio Section (TID 5004)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (125001, DCM, "Fetal Biometry Ratios")	✓	

2	>	HAS OBS CONTEXT	TEXT	EV (11951-1,LN, "Fetus ID")	✓	Value of "1", "2", "3" or "4" is used as identifier of the Fetus. -- This value is actually inserted as invocation of TID 1008 (Subject context - Fetus) -- This value is present only if more than one fetus exist.
3	>	CONTAINS	NUM	Measurements from CID 12004 (Fetal Biometry Ratios) are included.	✓	These biometry measurements are added as part of invocation of Measurement (TID 300) template.

A.2.2.3.1 Fetal Biometry Ratios used in HD11 (CID 12004)

HD11 defines an extension of CID 12004 to include HrtC / TC ratio as part of this context group. Following table shows the concepts in CID 12004 (including the private extension for HD11) that are used in HD11.

CSD	CV	Code Meaning
LN	11947-9	HC/AC
LN	11947-9	FL/AC
LN	11872-9	FL/BPD
LN	11823-2	Cephalic Index
99PMSBLUS	C12004-01	HrtC/TC (Heart Circumference/Thoracic Circumference)

A.2.2.4 Fetal Biometry Section (TID 5005)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (125002, DCM, "Fetal Biometry")	✓	
2	>	HAS OBS CONTEXT	TEXT	EV (11951-1,LN, "Fetus ID")	✓	Will be present if more than one fetus.
3	>	CONTAINS	INCLUDE	Biometry Group (DTID 5008)	✓	Measurements from DCID 12005 are used as 'Biometry type' to invoke this template one or more number of times. Refer to section A.2.2.6.1 for details of Biometry Group template usage.

A.2.2.4.1 Fetal Biometry Measurements used in HD11 (CID 12005)

HD11 defines a private extension to CID 12005 to include measurements available on HD11 but not (yet) defined in this context group. The following table shows the measurements from CID 12005 (including HD11 private extensions) that are used in HD11. All private extensions will use the coding scheme designator as 99PMSBLUS.

CSD	CV	Code Meaning
LN	11979-2	Abdominal Circumference
LN	11818-2	Anterior-Posterior Abdominal Diameter
LN	11820-8	Biparietal Diameter

LN	11965-1	Foot Length
LN	11984-2	Head Circumference
LN	11851-3	Occipital-Frontal Diameter
LN	11988-3	Thoracic Circumference
LN	11862-0	Transverse Abdominal Diameter
LN	11864-6	Transverse Thoracic Diameter
LN	11862-0	Transverse Abdominal Diameter
99PMSBLUS	C12005-01	Ear length
99PMSBLUS	C12005-02	Fetal trunk Cross sectional Area
99PMSBLUS	C12005-03	Heart Circumference
99PMSBLUS	C12005-04	Length of middle Phalanx of the 5th Digit
99PMSBLUS	C12005-05	Renal Width
99PMSBLUS	C12005-06	Renal length
99PMSBLUS	C12005-07	Anterior-Posterior thoracic diameter
99PMSBLUS	C12005-08	Transverse trunk Diameter

A.2.2.5 Fetal Long Bones Section (TID 5006)

Fetal Long Bones section is inserted in the SR Document in the same way as Fetal Biometry Section (Refer section 1.A.2.2.4). $Biometry Type used to invoke the template TID 5008 is taken from the context group Fetal Long Bones Measurement (CID 12006). All the measurements in CID 12006 are available in HD11 as described in the following table.

CSD	CV	Code Meaning
LN	11966-9	Humerus length
LN	11967-7	Radius length
LN	11969-3	Ulna length
LN	11968-5	Tibia length
LN	11964-4	Fibula length
LN	11962-8	Clavicle length
LN	11963-6	Femur Length

A.2.2.6 Fetal Cranium Section (TID 5007)

Fetal Cranium section is inserted in the SR Document in the same way as Fetal Biometry Section (Refer section 1.A.2.2.4). $Biometry Type used to invoke the template TID 5008 is taken from the context group Fetal Cranium (CID 12007).

HD11 defines a private extension to CID 12007 to include cranial measurements available in HD11 but not (yet) defined in CID 12007. The following table shows the measurements from CID 12007 (including HD11 private extensions) that are used in HD11. All private extensions will use the coding scheme designator as 99PMSBLUS.

CSD	CV	Code Meaning
LN	12171-5	Lateral Ventrical width

LN	11860-4	Cisterna Magna Length
LN	12146-7	Nuchal Fold thickness
LN	33070-4	Inner Orbital Diameter
LN	11629-3	Outer Orbital Diameter
LN	11863-8	Trans Cerebellar Diameter
99PMSBLUS	C12007-01	Diameter of the First Orbit
99PMSBLUS	C12007-02	Diameter of the Second Orbit

A.2.2.6.1 Fetal Biometry Group (TID 5008)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT(125005, DCM, "Biometry Group")	✓	
2	>	CONTAINS	NUM	Measurement of selected 'BiometryType'	✓	This row and next two rows are inserted as part of TID 300 (Measurement) invocation. If multiple measurements are made of the same biometry type, these three rows will be repeated for each measurement instance.

3	>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	An ordered set of one or more integers that uniquely identify the Image in the 'Image Library' section of this SR document. This is the image from which the measurement is inferred. This item will not be present, if the measurement does not refer to any image.
4	>>	HAS CONCEPT MOD	CODE	Derivation	✓	If a user has performed more than one measurement then he / she can either use average (default) of these instances or he can specifically select one of the measured instance for using in calculations. If the selection is Average, then that average measurement instance will have a derivation modifier as (R-00317, SRT, "Mean").
5	>>	HAS PROPERTIES	CODE	Selection Status	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.
6	>	CONTAINS	NUM	EV (18185-9, LN, "Gestational Age")	✓	This will be present if user has selected the corresponding gestation age calculation. For example, if the biometry type is BPD and user has selected GA (BPD) as one of the calculations (from the analysis setup application), this row will be present. HD11 system automatically calculates the GA based on standard (or user defined) equations and tables.

7	>>	INFERRED FROM	CODE	Equation or Table	✓	Concepts from CID 12013, Gestation age equations and tables will be used. Refer to section A.2.2.15 for concepts used in HD11.

A.2.2.7 Fetal Biophysical Profile Section (TID5009)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (125006, DCM, "Biophysical Profile")	✓	
2	>	HAS OBS CONTEXT	TEXT	EV (11951-1,LN, "Fetus ID")	✓	Will be present if more than one fetus.
3	>	CONTAINS	NUM	EV (11631-9, LN, "Gross Body Movement")	✓	HD11 uses the value as entered in the reporting screen.

4	>	CONTAINS	NUM	EV (11632-7, LN, "Fetal Breathing")	✓	HD11 uses the value as entered in the reporting screen.
5	>	CONTAINS	NUM	EV (11635-0, LN, "Fetal Tone")	✓	HD11 uses the value as entered in the reporting screen.
6	>	CONTAINS	NUM	EV (11630-1, LN, "Amniotic Fluid Volume")	✓	HD11 uses the value as entered in the reporting screen.
7	>	CONTAINS	NUM	DT (11634-3, LN, "Biophysical Profile Sum Score")	✓	HD11 automatically calculates the sum of all the scores.

A.2.2.8 Early Gestation Section (TID 5011)

Early Gestation section is inserted in the SR Document in the same way as Fetal Biometry Section (Refer section 1.A.2.2.4). $Biometry Type used to invoke the template TID 5008 is taken from the context group Early Gestation Biometry Measurements (CID 12009).

CSD	CV	Code Meaning

LN	11957-8	Crown Rump Length
LN	118505-5	Gestational Sac Diameter
LN	33071-2	Spine Length

A.2.2.9 Amniotic Sac section (TID 5010)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (121070, DCM, "Findings")	✓	
2	>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	✓	DT (T-F1300, SRT, "Amniotic Sac")
3	>	CONTAINS	NUM	(11627-7, LN, "Amniotic Fluid Index")	✓	This is inserted as part of the invocation of template TID 300 (Measurement)
4	>	CONTAINS	NUM	(11624-4, LN, "First Quadrant Diameter")	✓	This is inserted as part of the invocation of template TID 300 (Measurement)

5	>>	HAS CONCEPT MOD	CODE	Derivation	✓	This will have a value 'Mean' IFF average measurement instance is used in calculations.
6	>>	HAS PROPERTIES	CODE	Selection Status	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.
7	>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	Refers to the image on which this measurement was done. --- Similarly other measurements from CID 12008 are added. The concepts are – (11624-4, LN, "First Quadrant Diameter"), (11626-9, LN, "Second Quadrant Diameter"), (11625-1, LN, "Third Quadrant Diameter"), (11623-6, LN, "Fourth Quadrant Diameter")

A.2.2.10 Pelvis and Uterus Section (TID 5015)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments

1			CONTAINER	DT (125011, DCM, "Pelvis and Uterus")	✓	
2	>	CONTAINS	CONTAINER	EV (T-83000, SRT, "Uterus")	✓	DITD 5016 (LWH Volume Group) is included. Uterus volume, length and width measurements are inserted. Group Name is 'Uterus'
3	>>	CONTAINS	NUM	(33192-6, LN, "Uterus Volume")	✓	This row is inserted as part of TID 300 (Measurement) invocation. HD11 automatically calculates the volume based on L,W and H measurements.
4	>>	CONTAINS	NUM	(11842-2, LN, "Uterus Length")	✓	This row is inserted as part of TID 300 (Measurement) invocation. -- Similar to rows 4,5 and 6, the concepts for Uterus Height and Uterus Width are added too. These concepts are: (11859-6, LN, "Uterus Height") and (11865-3,LN, " Uterus Width")
5	>>>	HAS CONCEPT MOD	CODE	"Derived"	✓	This will have a value 'Mean' IFF the average measurement instance is used in calculations.

6	>>>	HAS PROPERTIES	CODE	Selection Status	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.
7	>>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	Refers to the image on which this measurement was done.
8	>	CONTAINS	NUM	(11961-0, LN, "Cervix Length")	✓	This measurement is from CID 12011, "Ultrasound Pelvic and Uterus". This is inserted as part of invocation of TID 300 (Measurement). Similar to other measurements, the concept modifier for 'Derivation', Selection Status and 'Referenced Content Item' would be present for this measurement. Note:- Only Cervix Length and Endometrium Thickness from CID 12011 will be present in rows 7 and 8. All bladder related measurements from CID 12011 will be present under the group 'Bladder' as shown in the rows from 9.

9	>	CONTAINS	NUM	(12145-9, LN, "Endometrium Thickness")	✓	This measurement is from CID 12011, "Ultrasound Pelvic and Uterus".
10	>	CONTAINS	CONTAINER	EV (T-74000, SRT, "Bladder")	✓	DITD 5016 (LWH Volume Group) is included. Bladder volume, length and width measurements are inserted. Group Name is 'Bladder'
11	>>	CONTAINS	NUM	(C12011-04, 99PMSBLUS, "Bladder Volume")	✓	This row is inserted as part of TID 300 (Measurement) invocation. HD11 automatically calculates the volume based on L,W and H measurements.
12	>>	CONTAINS	NUM	(C12011-01, 99PMSBLUS, "Bladder Length")	✓	This row is inserted as part of TID 300 (Measurement) invocation. -- Similar to rows 11,12 and 13, the concepts for Bladder Width and Bladder Height are added too. These concepts are: (C12011-02, 99PMSBLUS, "Bladder Width") and (C12011-03, 99PMSBLUS, "Bladder Height")

13	>>>	HAS CONCEPT MOD	CODE	"Derived"	✓	This will have a value 'Mean' IFF the average measurement instance is used in calculations.
14	>>>	HAS PROPERTIES	CODE	Selection Status	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.
15	>>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	Refers to the image on which this measurement was done.
16	>	CONTAINS	CONTAINER	EV (T-74000, SRT, "Bladder")	✓	DITD 5016 (LWH Volume Group) is included. Post Void Bladder volume, length and width measurements are inserted. Group Name is 'Bladder'
17	>>	CONTAINS	NUM	(C12011-08, 99PMSBLUS, "Post Void Bladder Volume")	✓	This row is inserted as part of TID 300 (Measurement) invocation. HD11 automatically calculates the volume based on L,W and H measurements.

18	>>	CONTAINS	NUM	(C12011-05, 99PMSBLUS, "Post Void Bladder Length")	✓	This row is inserted as part of TID 300 (Measurement) invocation. -- Similar to rows 16,17 and 18, the concepts for Post Void Bladder Width and Post Void Bladder Height are added too. These concepts are: (C12011-06, 99PMSBLUS, "Post Void Bladder Width") and (C12011-07, 99PMSBLUS, "Post Void Bladder Height")
19	>>>	HAS CONCEPT MOD	CODE	"Derived"	✓	This will have a value 'Mean' IFF the average measurement instance is used in calculations.
20	>>>	HAS PROPERTIES	CODE	Selection Status	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.
21	>>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	Refers to the image on which this measurement was done.

A.2.2.10.1 **CID 12011 Ultrasound Pelvis And Uterus**

HD11 uses a private extension to CID 12011 to define new concepts for Bladder related measurements. Following table shows the details.

CSD	CV	CM
LN	11961-0	Cervix Length
LN	12145-9	Endometrium Thickness
99PMSBLUS	C12011-01	Bladder Length
99PMSBLUS	C12011-02	Bladder Width
99PMSBLUS	C12011-03	Bladder Height
99PMSBLUS	C12011-04	Bladder Volume
99PMSBLUS	C12011-05	Post Void Bladder Length
99PMSBLUS	C12011-06	Post Void Bladder Width
99PMSBLUS	C12011-07	Post Void Bladder Height
99PMSBLUS	C12011-08	Post Void Bladder Volume

A.2.2.11 Ovaries Section (TID 5012)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (121070, DCM, "Findings")	✓	
2	>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	✓	DT (T-87000, SRT, "Ovary")

3	>	CONTAINS	CONTAINER	EV (T-87000, SRT, "Ovary")	✓	DITD 5016 (LWH Volume Group) is included. Left ovary volume, length and width measurements are inserted. Group name is 'Ovary'
4	>>	CONTAINS	NUM	EV (12164-0, LN, "Left Ovary Volume")	✓	This row is inserted as part of TID 300 (Measurement) invocation. HD11 automatically calculates the volume based on L, W and H measurements.
5	>>	CONTAINS	NUM	EV (11840-6, LN, "Left Ovary Length")	✓	This row is inserted as part of TID 300 (Measurement) invocation. -- Similar to rows 5, 6 and 7, the concepts for Ovary Height and Ovary Width are added too. These concepts are: EV (11857-0 , LN," Left Ovary Height") and EV (11829-9,LN, "Left Ovary Width")
6	>>>	HAS CONCEPT MOD	CODE	"Derived"	✓	This will have a value "Mean" IFF the average measurement instance is used in calculations.
7	>>>	HAS PROPERTIES	CODE	Selection Status	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.

8	>>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	Refers to the image on which this measurement was done.
						Similarly DITD 5016 (LWH Volume Group) is included for Right ovary volume, length and width measurements. The related concepts codes are – $GroupName = EV (T-87000, SRT, "Ovary") $Width = EV (11830-7, LN, "Right Ovary Width") $Length = EV (11841-4, LN, "Right Ovary Length") $Height = EV (11858-8, LN, "Right Ovary Height") $Volume= EV (12165-7, LN, "Right Ovary Volume")

A.2.2.12 Follicles Section (TID 5013)

SR Document may contain two instances of the Follicles section. First instance is included for left ovarian follicles and the second instance is included for right ovarian follicle. Laterality concept modifier will be used accordingly. Measurements for up to 16 follicles may be included in this section.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments

1			CONTAINER	DT (121070, DCM, "Findings")	✓	
2	>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	✓	DT (T-87600, SRT, "Ovarian Follicle")
3	>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	✓	EV (G-A101, SRT, "Left") OR EV (G-A100, SRT, "Right")
4	>	CONTAINS	NUM	EV (11879-4, LN, "Number of follicles in left ovary") OR EV (11880-2, LN, "Number of follicles in right ovary")	✓	Number of follicles in the ovary.
5	>	CONTAINS	CONTAINER	EV (125007, DCM, "Measurement Group")	✓	Template TID 5014 (Follicle Measurement Group) is included.
6	>>	HAS OBS CONTEXT	TEXT	EV (12510, DCM, "Identifier")	✓	HD11 uses numbers "1", "2", "3".. up to "16" to identify the follicle. -- Row 6, 7 and 8 are added per follicle measurement.
7	>>	CONTAINS	NUM	EV (G-D705, SRT, "Volume")	✓	This is inserted as part of TID 300 invocation. HD11 automatically calculates the volume based on the follicle diameter.

8	>>	CONTAINS	NUM	(11793-7, LN, "Follicle diameter")	✓	This is inserted as part of TID 300 invocation.

A.2.2.13 OB-GYN Fetus Vascular Ultrasound Measurement Group (TID 5025)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (T-F6800, SRT, "Embryonic Vascular Structure")	✓	
2	>	HAS OBS CONTEXT	TEXT	EV (11951-1,LN, "Fetus ID")	✓	Will be present if more than one fetus.
3	>	CONTAINS	NUM	Measurement of selected fetal vascular anatomic location.	✓	Measurement types from TID 12119 (Vascular Ultrasound Property) for the anatomical locations specified in CID 12141 (Fetal Vasculature Anatomic Locations) are used.

A.2.2.13.1 Fetus Vascular Measurements used in HD11

HD11 uses a private extension to CID 12141 to define a new fetal vascular anatomical location for 'Ductus Venosus'. Also, the anatomical location 'Umbilical Artery' defined in CID 12140 ('Pelvic Vasculature Anatomic Location') has been included in CID 12141 as HD11 considers this as Fetus measurement rather than Pelvic measurement.

Following table shows the extension to Fetal Vasculature Anatomical Locations (CID 12141) used by HD11.

CSD	CV	CM
99PMSBLUS	C12141-01	Ductus Venosus
SRT	T-F1810	Umbilical Artery

Following table shows the fetus vascular measurements (and calculations) used in HD11 as part of TID 5025.

HD11 Measurement	Measurement Type from CID 12119 and it's includes.	Vascular Anatomic Location from CID 12141
Diastolic Velocity (Ductus Venosus)	(LN, 11653-3, Diastolic Velocity)	(99PMSBLUS, C12141-01, Ductus Venosus)
Systolic Velocity (Ductus Venosus)	(LN, 11726-7, Peak Systolic Velocity)	(99PMSBLUS, C12141-01, Ductus Venosus)
Time Averaged Peak Velocity (Ductus Venosus)	(LN, 11692-1, Time averaged peak velocity)	(99PMSBLUS, C12141-01, Ductus Venosus)
Diastolic Velocity (Umbilical Artery)	(LN, 11653-3, Diastolic Velocity)	(SRT, T-F180, Umbilical Artery)
Systolic Velocity (Umbilical Artery)	(LN, 11726-7, Peak Systolic Velocity)	(SRT, T-F180, Umbilical Artery)
Time Averaged Peak Velocity (Umbilical Artery)	(LN, 11692-1, Time averaged peak velocity)	(SRT, T-F180, Umbilical Artery)

Diastolic Velocity (Middle Cerebral Artery)	(LN, 11653-3, Diastolic Velocity)	(SRT, T-45600, Middle Cerebral Artery)
Systolic Velocity (Middle Cerebral Artery)	(LN, 11726-7, Peak Systolic Velocity)	(SRT, T-45600, Middle Cerebral Artery)
Time Averaged Peak Velocity (Middle Cerebral Artery)	(LN, 11692-1, Time averaged peak velocity)	(SRT, T-45600, Middle Cerebral Artery)
Pulsatility Index (Ductus Venosus)	(LN, 12008-9, Pulsatility Index)	(99PMSBLUS, C12141-01, Ductus Venosus)
Resistivity Index (Ductus Venosus)	(LN, 12023-8, Resistivity Index)	(99PMSBLUS, C12141-01, Ductus Venosus)
Systolic to Diastolic Ratio (Ductus Venosus)	(LN, 12144-2, Systolic to Diastolic Velocity Ratio)	(99PMSBLUS, C12141-01, Ductus Venosus)
Pulsatility Index (Middle Cerebral Artery)	(LN, 12008-9, Pulsatility Index)	(SRT, T-45600, Middle Cerebral Artery)
Resistivity Index (Middle Cerebral Artery)	(LN, 12023-8, Resistivity Index)	(SRT, T-45600, Middle Cerebral Artery)
Systolic to Diastolic Ratio (Middle Cerebral Artery)	(LN, 12144-2, Systolic to Diastolic Velocity Ratio)	(SRT, T-45600, Middle Cerebral Artery)

Pulsatility Index (Umbilical Artery)	(LN, 12008-9, Pulsatility Index)	(SRT, T-F180, Umbilical Artery)
Resistivity Index (Umbilical Artery)	(LN, 12023-8, Resistivity Index)	(SRT, T-F180, Umbilical Artery)
Systolic to Diastolic Ratio (Umbilical Artery)	(LN, 12144-2, Systolic to Diastolic Velocity Ratio)	(SRT, T-F180, Umbilical Artery)

A.2.2.14 OB-GYN Pelvic Vascular Ultrasound Measurement Group (TID 5026)

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (T-D6007, SRT, "Pelvic Vascular Structure")	✓	
2	>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT "Laterality")	✓	Laterality is used only if the measurement needs to be qualified with the laterality of the anatomy.

3	>	CONTAINS	NUM	Measurement of selected pelvic vascular anatomic location.	✓	Measurement types from TID 12119 (Vascular Ultrasound Property) for the anatomical locations specified in CID 12140 (Pelvic Vasculature Anatomic Locations) are used.

A.2.2.14.1 Pelvic Vascular Measurements used in HD11

Following table shows the pelvic vascular measurements (and calculations) used in HD11 as part of TID 5026.

HD11 Measurement	**Measurement Type from CID 12119 and it's includes.**	**Vascular Anatomic Location from CID 12140**
Diastolic Velocity (Left Ovarian Artery)	(LN, 11653-3, Diastolic Velocity)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Systolic Velocity (Left Ovarian Artery)	(LN, 11726-7, Peak Systolic Velocity)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Time Averaged Peak Velocity (Left Ovarian Artery)	(LN, 11692-1, Time averaged peak velocity)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Diastolic Velocity (Right Ovarian Artery)	(LN, 11653-3, Diastolic Velocity)	(SRT, T-46980, Ovarian Artery) $Laterality = Right
Systolic Velocity (Right Ovarian Artery)	(LN, 11726-7, Peak Systolic Velocity)	(SRT, T-46980, Ovarian Artery) $Laterality = Right
Time Averaged Peak Velocity (Right Ovarian Artery)	(LN, 11692-1, Time averaged peak velocity)	(SRT, T-46980, Ovarian Artery) $Laterality = Right

Diastolic Velocity (Uterine Artery)	(LN, 11653-3, Diastolic Velocity)	(SRT, T-46820, Uterine Artery)
Systolic Velocity (Uterine Artery)	(LN, 11726-7, Peak Systolic Velocity)	(SRT, T-46820, Uterine Artery)
Time Averaged Peak Velocity (Uterine Artery)	(LN, 11692-1, Time averaged peak velocity)	(SRT, T-46820, Uterine Artery)
Pulsatility Index (Left Ovarian Artery)	(LN, 12008-9, Pulsatility Index)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Resistivity Index (Left Ovarian Artery)	(LN, 12023-8, Resistivity Index)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Systolic to Diastolic Ratio (Left Ovarian Artery)	(LN, 12144-2, Systolic to Diastolic Velocity Ratio)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Pulsatility Index (Right Ovarian Artery)	(LN, 12008-9, Pulsatility Index)	(SRT, T-46980, Ovarian Artery) $Laterality = Left
Resistivity Index (Right Ovarian Artery)	(LN, 12023-8, Resistivity Index)	(SRT, T-46980, Ovarian Artery) $Laterality = Right
Systolic to Diastolic Ratio (Right Ovarian Artery)	(LN, 12144-2, Systolic to Diastolic Velocity Ratio)	(SRT, T-46980, Ovarian Artery) $Laterality = Right
Pulsatility Index (Uterine Artery)	(LN, 12008-9, Pulsatility Index)	(SRT, T-46820, Uterine Artery)
Resistivity Index (Uterine Artery)	(LN, 12023-8, Resistivity Index)	(SRT, T-46820, Uterine Artery)
Systolic to Diastolic Ratio (Uterine Artery)	(LN, 12144-2, Systolic to Diastolic Velocity Ratio)	(SRT, T-46820, Uterine Artery)

A.2.2.15 Gestation Age Equations & Tables used in HD11

CSD	CV	Code Meaning
LN	11885-1	Gestational Age by LMP
LN	11884-4	Average Ultrasound Age
LN	11892-7	AC, Hadlock 1984
LN	11902-4	BPD, Hadlock 1984
LN	11905-7	BPD, Jeanty 1984
LN	33082-9	BPD, Osaka 1989
LN	33085-2	BPD, Tokyo 1986
LN	11917-2	CRL, Jeanty 1984
LN	33093-6	CRL, Osaka 1989
LN	33094-4	CRL, Rempen 1991
LN	11914-9	CRL, Robinson 1975
LN	33096-9	CRL, Tokyo 1986
LN	11920-6	FL, Hadlock 1984
LN	11923-0	FL, Jeanty 1984
LN	33101-7	FL, Osaka 1989
LN	33103-3	FL, Tokyo 1986
LN	11929-7	GS, Rempen 1991
LN	33108-2	GS, Tokyo 1986
LN	11932-1	HC, Hadlock 1984
LN	11934-7	HC, Jeanty 1984
LN	33117-3	Humerus Length, Osaka 1989
LN	33127-2	Spine Length, Tokyo, 1989
LN	11941-2	Tibia, Jeanty 1984

LN	33135-5	TCD, Nimrod 1986
LN	33138-9	Fetal Trunk Cross Sectional Area, Osaka 1989
LN	11944-6	Ulna, Jeanty 1984

A.2.2.16 OB Fetal Body Weight Equations & Tables used in HD11

CSD	CV	Code Meaning
LN	11738-2	EFW by AC, BPD, Hadlock 1984
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
LN	33140-5	EFW by BPD, FTA, FL, Osaka 1990
LN	33144-7	EFW by BPD, APAD, TAD, FL, Tokyo 1987

A.2 Cardiac structured report template

HD11 implements the Cardiac template (TID 5200) from the DICOM standard, part 16. This appendix describes the scope and manner that HD11 measurements appear in DICOM SR.

Measurements and calculations performed for cardiac studies will lead to creation of "Echocardiography Procedure Report" structured report document. Measurements can be performed by pressing the 'Calc' key on HD11 control panel. Measurements and calculations available in the menu can be configured through the setup application. It is also possible to configure the measurement unit (Metric or U.S).

All concepts with value type (VT) NUM will always have a 'MeasurementUnitCodeSequence' that specifies the unit of the measurement. The CSD for all units will be UCUM (Unified Code for Units) and CV and CM will be based on application configuration and will confirm to UCUM standards.

A.2.1 Template specific conformance for TID 5200

The template for the root of the content tree for TID 5200 and its use in the HD11 context is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (125200, DCM, "Adult Echocardiography Procedure Report")	✓	This is the root 'CONTAINER'
2	>	HAS CONCEPT MOD	INCLUDE	DTID (1204) Language of Content Item and Descendants	x	This module is not used in HD11 at present.

3	>	HAS OBS CONTEXT	INCLUDE	DTID (1001) Observation Context	x	Although DICOM specifies this as a mandatory section, none of the attributes under DTID 1001 are mandatory.
4	>	CONTAINS	INCLUDE	DTID (5201) Echocardiography Patient Characteristics	✓	Refer A.2.3 for HD11 usage of this.
5	>	CONTAINS	CONTAINER	DT (111028, DCM, "Image Library")	✓	Contains list of 'IMAGE' items on which the measurements have been performed. Subsequent measurement concept content items refer to these IMAGE items using INFERRED FROM relationship.
6	>>	CONTAINS	IMAGE	No purpose of reference	✓	One or more 'IMAGE' items on which the measurements have been performed.
7	>	CONTAINS	INCLUDE	DTID (T5200-03) Echo Procedure Summary Section	✓	Refer to A.2.2 for HD11 usage of this.
8	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12200 will be used with $SectionSubject as 'Left Ventricle', refer to A.2.7 for HD11 usage of this.
9	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12204 will be used with $SectionSubject as 'Right Ventricle', refer to A.2.11 for HD11 usage of this.
10	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12205 will be used with $SectionSubject as 'Left Atrium', refer to A.2.12 for HD11 usage of this.

11	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12206 will be used with $SectionSubject as 'Right Atrium', refer to A.2.13 for HD11 usage of this.
12	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12211 will be used with $SectionSubject as 'Aortic Valve', refer to A.2.17 for HD11 usage of this.
13	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12207 will be used with $SectionSubject as 'Mitral Valve', refer to A.2.14 for HD11 usage of this.
14	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12209 will be used with $SectionSubject as 'Pulmonic Valve', refer to A.2.16 for HD11 usage of this.
15	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12208 will be used with $SectionSubject as 'Tricuspid Valve', refer to A.2.15 for HD11 usage of this.
16	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	✓	Concepts in CID 12212 will be used with $SectionSubject as 'Aorta', refer to A.2.18 for HD11 usage of this.
17	>	CONTAINS	CONTAINER	DTID (5202) Echo Section	✓	Concepts in CID 12217 will be used with $SectionSubject as 'Cardiac Shunt Study', refer to A.2.19 for HD11 usage of this.
18	>	CONTAINS	CONTAINER	DTID (5204) Wall Motion Analysis	✓	This section is used to include all Wall Motion Analysis related details. Refer to A.2.6 for more details.
19	>	CONTAINS	CONTAINER	DTID (5202) Echo Section	✓	Concepts in CID 99200 will be used with $SectionSubject as 'Left Heart', refer to A.2.32 for HD11 usage of this.

20	>	CONTAINS	CONTAINER	DTID (5202) Echo Section	✓	Concepts in CID 99200 will be used with $SectionSubject as 'Right Heart', refer to A.2.32 for HD11 usage of this.
21	>	CONTAINS	CONTAINER	DTID (5202) Echo Section	✓	Concepts in CID 99201 will be used with $SectionSubject as 'Patent Ductus Arteriosis', refer to A.2.33 for HD11 usage of this.

A.2.2 Echo Procedure Summary Section (TID 5200-03)

This is a privately defined template to put all the observations, findings and comments entered for the cardiac study in the reporting screen. The following table describes the use of this template in the context of HD11.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	DT (121111, DCM, "Summary")	✓	
2	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	✓	This field contains all observations, findings (only the Finding text value preceded by the Finding Group Name) and the comments entered in the reporting screen on the HD11.

A.2.3 Echocardiography Patient Characteristics (TID 5201)

Use of the template TID 5201 in the context of HD11 is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (121118, DCM, "Patient Characteristics")	✓	
2	>	CONTAINS	NUM	EV (121033, DCM, "Subject Age")	✓	Value is taken from PDE (Patient Data Entry) screen or from the MWL. Concepts from the DCID 7456 are used for putting the units for age.
3	>	CONTAINS	CODE	EV (121032, DCM, "Subject Sex")	✓	Value is taken from PDE (Patient Data Entry) screen or from the MWL and the corresponding Concepts are taken from the DCID 7455.
4	>	CONTAINS	NUM	EV (8867-4, LN, "Heart Rate")	✓	Value is taken from the Heart Rate study attribute value entered in HD11 reporting application.
5	>	CONTAINS	NUM	EV (F008EC, SRT, "Systolic Blood Pressure")	✓	Value is taken from PDE (Patient Data Entry) screen.
6	>	CONTAINS	NUM	EV (F008ED, SRT, "Diastolic Blood Pressure")	✓	Value is taken from PDE (Patient Data Entry) screen.
7	>	CONTAINS	NUM	EV (8277-6, LN, "Body Surface Area")	✓	Value automatically calculated by the HD11 system based on the Height and Weight values entered on PDE (Patient Data Entry) screen.
8	>>	INFERRED FROM	CODE	EV (8248-4, LN, "Body Surface Area Formula")	x	This value is not used in HD11 at present.

A.2.4 Echo Section (TID 5202)

This template is invoked multiple times by passing different section subjects as 'Finding Site' value. Use of the template TID 5202 in the context of HD11 is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (121070, DCM, "Findings")	✓	
2	>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	✓	Value passed in the parameter $SectionSubject is given here.
3	>	CONTAINS	CONTAINER	DT (125007, DCM, "Measurement Group")	✓	
4	>>	HAS CONCEPT MOD	CODE	EV (G-0373, SRT,"Image Mode")	x	This value is not used in HD11 at present.
5	>>	HAS CONCEPT MOD	CODE	DT (125203,DCM,"Acquisition Protocol")	x	This value is not used in HD11 at present.
6	>	CONTAINS	INCLUDE	DTID (5203) Echo Measurement	✓	This template is invoked multiple times for all the measurements done on the $SectionSubject. Refer to section A.2.5 for details of HD11 usage of this.

A.2.5 Echo Measurement (TID 5203)

Use of the template TID 5203 in the context of HD11 is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			INCLUDE	DTID (300) Measurement	✓	
2	>>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	✓	This row is used only if the measurement or calculation this template is invoked with mandates it. Otherwise this row is not used. The values are taken from the BCID 12227.
3	>>	INFERRED FROM	IMAGE	ReferencedContentItemIdentifier	✓	Refers to the image on which this measurement was done.
4	>>	INFERRED FROM	NUM	ReferencedContentItemIdentifier	✓	This row is used only if the measurement or calculation this template is invoked with is of type MOD Volume measurements. In this case, reference to those twenty Left Ventricle MOD Diam entries, based on which this volume measurement is calculated is given here.
	>>	HAS PROPERTIES	CODE	EV (121404, DCM, "Selection Status")	✓	This will have a value 'Mean Value Chosen' if the Derivation is 'Mean'. In all other cases, this will have a value, 'User Chosen Value'.

5	>	HAS CONCEPT MOD	CODE	EV (G-C048, SRT, "Flow Direction")	✓	This row is used only if the measurement or calculation this template is invoked with mandates it. Otherwise this row is not used. The values are taken from the BCID 12221.
6	>	HAS CONCEPT MOD	CODE	EV (R-40899, SRT,"Respiratory Cycle Point")	x	This value is not used in HD11 at present.
7	>	HAS CONCEPT MOD	CODE	EV (R-4089A, SRT,"Cardiac Cycle Point")	✓	IFF $Measurement = (99PMSBLUS, C12201-01, "Left Ventricle MOD Diam")
8	>	HAS CONCEPT MOD	CODE	EV (G-0373, SRT, "Image Mode")	✓	This row is used only if the measurement or calculation this template is invoked with mandates it. Otherwise this row is not used. The values are taken from the BCID 12224.
9	>	HAS CONCEPT MOD	CODE	EV (111031, DCM, "Image View")	✓	This row is used only if the measurement or calculation this template is invoked with mandates it. Otherwise this row is not used. The values are taken from the BCID 12226.
10	>	HAS CONCEPT MOD	TEXT	EV (99PMSBLUS, T5203-01, "Simpson's Disk Number")	✓	IFF $Measurement = (99PMSBLUS, C12201-01, "Left Ventricle MOD Diam")

A.2.6 Wall Motion Analysis (TID 5204)

This template is invoked as many times as the number of the Wall Motion stages done for the stress study. Use of the template TID 5204 in the context of HD11 is described in the following table.

No	NL	REL WITH PARENT	VT	Concept Name	Used in HD11	Comments
1			CONTAINER	EV (121070, DCM, ”Findings”)	✓	
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, ”Procedure reported”)	✓	DT (P5-B3121, SRT, "Echocardiography for Determining Ventricular Contraction")
3	>	HAS ACQ CONTEXT	CODE	EV (LN, 18139-6, "Stage")	x	This value is not used in HD11 at present.
4	>	CONTAINS	IMAGE	EV (125201, DCM, "Illustration of Finding")	x	This value is not used in HD11 at present.
5	>	CONTAINS	TEXT	EV (LN, 18118-0, “LV Wall Motion Segmental Findings”)	x	This value is not used in HD11 at present.
6	>	CONTAINS	NUM	DT (125202, DCM, “LV Wall Motion Score Index”)	✓	HD11 computes the Wall Motion Score index from the assessment done on the Wall segments for that particular stage.
7	>>	HAS CONCEPT MOD	CODE	EV (G-E048, SRT, “Assessment Scale”)	✓	HD11 uses the 5 Point Segment Finding Scale for Wall motion score index. Concept from BCID 12238 is used here.
8	>	CONTAINS	CONTAINER	EV (121070, DCM, "Findings")	✓	
9	>>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, “Finding Site”)	✓	DT (T-D0772, SRT, ”Myocardial Wall”)

10	>>	CONTAINS	CODE	EV (LN, 18179-2, "Wall Segment")	✓	HD11 performs Wall motion analysis based on 16-segment assessment. Concepts for the segments are taken from the BCID 3717.
11	>>>	HAS PROPERTIES	CODE	EV (F-32050, SRT, "Cardiac Wall Motion")	✓	Concepts from DCID 3703 are used here. This row will be present only if row 12 is absent.
12	>>>	HAS PROPERTIES	CODE	EV (G-C504, SRT, "Associated Morphology")	✓	Concepts from DCID 3704 are used here. This row will be present only if row 11 is absent.
13	>>>	HAS PROPERTIES	NUM	DT (G-C1E3, SRT, "Score")	✓	

A.2.7 CID 12200 Echocardiography Left Ventricle

This section lists the measurements and associated calculations from CID12200 (and the includes of CID 12200), which can be performed on HD11.

Code Scheme	Code Value	Concept Name
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12201 Left Ventricle Linear		
INCLUDE CID 12240 Left Ventricle Area		
INCLUDE CID 12202 Left Ventricle Volume		
INCLUDE CID 12222 Orifice Flow Properties		
INCLUDE CID 12203 Left Ventricle Other		
INCLUDE CID 12239 Cardiac Output Properties		

A.2.8 CID 12201 Left Ventricle Linear

This section lists the measurements and associated calculations from CID12201, which can be performed on HD11.

CSD	CV	CM
LN	29436-3	Left Ventricle Internal End Diastolic Dimension
LN	29438-9	Left Ventricle Internal Systolic Dimension
LN	18051-3	Left Ventricular Fractional Shortening
LN	18154-5	Interventricular Septum Diastolic Thickness
LN	18158-6	Interventricular Septum Systolic Thickness
LN	18077-8	Left Ventricle diastolic major axis
LN	18076-0	Left Ventricle systolic major axis
LN	18156-0	Left Ventricle Posterior Wall Systolic Thickness
LN	18152-9	Left Ventricle Posterior Wall Diastolic Thickness
99PMSBLUS	C12201-01	Left Ventricle MOD Diam

A.2.9 CID 12202 – Left Ventricle Volume

This section lists the measurements and associated calculations from CID12202, which can be performed on HD11.

CSD	CV	CM
LN	18026-5	Left Ventricular End Diastolic Volume
LN	18148-7	Left Ventricular End Systolic Volume
LN	18043-0	Left Ventricular Ejection Fraction

A.2.10CID 12203 – Left Ventricle Other

This section lists the measurements and associated calculations from CID12203, which can be performed on HD11.

CSD	CV	CM

LN	18087-7	Left Ventricle Mass
LN	18071-1	Left Ventricular Isovolumic Relaxation Time

A.2.11 CID 12204 – Echocardiography Right Ventricle

This section lists the measurements and associated calculations from CID12204 (and the includes of 12204), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
INCLUDE CID 12239 Cardiac Output Properties		
LN	20304-2	Right Ventricular Internal Diastolic Dimension
SRT	G-0380	Right Ventricular Peak Systolic Pressure
LN	18153-7	Right Ventricular Anterior Wall Diastolic Thickness

A.2.12 CID 12205 – Echocardiography Left Atrium

This section lists the measurements and associated calculations from CID12205 (and the includes of 12205), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	29469-4	Left Atrium Antero-posterior Systolic Dimension
LN	17985-3	Left Atrium to Aortic Root Ratio

A.2.13 CID 12206 – Echocardiography Right Atrium

This section lists the measurements and associated calculations from CID12206 (and the includes of 12206), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	18070-3	Right Atrium Systolic Pressure

A.2.14 CID 12207 – Echocardiography Mitral Valve

Apart from the below measurements, HD11 defines an extension of CID 12207 to include additional Concepts for Mitral valve as shown below.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
INCLUDE CID 12239 Cardiac Output Properties		
LN	17978-8	Mitral Valve A-Wave Peak Velocity
LN	18037-2	Mitral Valve E-Wave Peak Velocity
LN	18038-0	Mitral Valve E to A Ratio
LN	18040-6	Mitral Valve E-F Slope by M-Mode
LN	18036-4	Mitral Valve EPSS, E wave
99PMSBLUS	C12207-01	Mitral Valve D-E Excursion
99PMSBLUS	C12207-06	Mitral Valve Flow Area

A.2.15 CID 12208 – Echocardiography Tricuspid Valve

This section lists the measurements and associated calculations from CID12208 (and the includes of 12208), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
LN	20296-0	Time from Q wave to Tricuspid Valve Opens

A.2.16 CID 12209 – Echocardiography Pulmonic Valve

This section lists the measurements and associated calculations from CID12209 (and the includes of 12209), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
LN	20295-2	Time from Q wave to Pulmonic Valve Closes

A.2.17 CID 12211 – Echocardiography Aortic Valve

This section lists the measurements and associated calculations from CID12211 (and the includes of 12211), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
LN	17996-0	Aortic Valve Cusp Separation

A.2.18 CID 12212 – Echocardiography Aorta

This section lists the measurements and associated calculations from CID12212 (and the includes of 12212), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	18015-8	Aortic Root Diameter
LN	18012-5	Ascending Aortic Diameter

A.2.19 CID 12217 – Echocardiography Cardiac Shunt

This section lists the measurements and associated calculations from CID12217 (and the includes of 12217), which can be performed on HD11.

CSD	CV	CM
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	29462-9	Pulmonary-to-Systemic Shunt Flow Ratio

A.2.20 CID 12220 – Echocardiography Common Measurements

This section lists the measurements and associated calculations from CID12220, which can be performed on HD11.

CSD	CV	CM
LN	8867-4	Heart rate

A.2.21 CID 12221 – Flow Direction

This section lists the Flow direction from CID1222, which are used by HD11.

CSD	CV	CM
SRT	R-42047	Antegrade Flow
SRT	R-42E61	Regurgitant Flow

A.2.22 CID 12222 – Orifice Flow Properties

Apart from below concepts, HD11 defines an extension of CID 12222 to include few more Orifice Flow property concepts.

CSD	CV	CM
LN	33878-0	Volume Flow
LN	34141-2	Peak Instantaneous Flow Rate
SRT	G-038E	Cardiovascular Orifice Area
SRT	G-038F	Cardiovascular Orifice Diameter
SRT	G-0390	Regurgitant Fraction
LN	11726-7	Peak Velocity
LN	20352-1	Mean Velocity
LN	20247-3	Peak Gradient
LN	20256-4	Mean Gradient
LN	20354-7	Velocity Time Integral

LN	20280-4	Pressure Half-Time
LN	20168-1	Acceleration Time
LN	20217-6	Deceleration Time
LN	20216-8	Deceleration Slope
99PMSBLUS	C12222-01	Flow Radius
99PMSBLUS	C12222-02	Alias Velocity
99PMSBLUS	C12222-03	Pressure Half-Time Peak velocity
99PMSBLUS	C12222-04	Minimum Velocity

A.2.23 CID 12223 – Echocardiography Stroke Volume Origin

This section lists the concepts from CID12223, which are used by HD11.

CSD	CV	CM
SNM3	T-32600	Left Ventricle
SNM3	T-35300	Mitral Valve
SNM3	T-42000	Aorta
SNM3	T-32650	Left Ventricle Outflow Tract
SNM3	T-32550	Right Ventricle Outflow Tract

A.2.24 CID 12224 – Ultrasound Image Modes

This section lists the Image modes from CID12224, which are used by HD11.

CSD	CV	CM
SRT	G-03A2	2D mode
SRT	G-0394	M mode

A.2.25 CID 12226 – Echocardiography Image View

This section lists the Image views from CID12226, which are used by HD11.

CSD	CV	CM
SRT	G-A19B	Apical two chamber

SRT	G-A19C	Apical four chamber
SRT	G-039B	Parasternal short axis at the Papillary Muscle level
SRT	G-039A	Parasternal short axis at the Mitral Valve level

A.2.26 CID 12228 – Volume Methods

Apart from using the below concepts for Volume methods, HD11 also extends the CID 12228 with two more concepts as given in the table.

CSD	CV	CM
DCM	125205	Area-Length Single Plane
DCM	125226	Single Plane Ellipse
DCM	125206	Cube Method
DCM	125207	Method of Disks, Biplane
DCM	125208	Method of Disks, Single Plane
DCM	125209	Teichholz
DCM	125211	Biplane Ellipse
99PMSBLUS	C12228-01	Bullet
99PMSBLUS	C12228-02	Method of Disks, Simpson

A.2.27 CID 12229 – Area Methods

This section lists the area methods from CID12229, which are used by HD11.

CSD	CV	CM
DCM	125214	Continuity Equation by Peak Velocity
DCM	125215	Continuity Equation by Velocity Time Integral
DCM	125216	Proximal Isovelocity Surface Area

A.2.28 CID 12231 – Volume Flow Methods

This section lists the volume flow methods from CID12231, which are used by HD11.

CSD	CV	CM

DCM	125216	Proximal Isovelocity Surface Area

A.2.29 CID 12238 – Wall Motion Scoring Schemes

This section lists the Wall Motion scoring scheme from CID12238, which are used by HD11.

CSD	CV	CM
DCM	125224	5 Point Segment Finding Scale

A.2.30 CID 12239 – Cardiac Output Properties

This section lists the Cardiac Output properties from CID12239, which are used by HD11.

CSD	CB	CM
SRT	F-32120	Stroke Volume
SRT	F-32100	Cardiac Output

A.2.31 CID 12240 – Left Ventricle Area

This section lists the Left Ventricle area from CID12240, which are used by HD11.

CSD	CV	CM
SRT	G-0374	Left Ventricular Systolic Area
SRT	G-0375	Left Ventricular Diastolic Area
SRT	G-0379	Left Ventricle Epicardial Diastolic Area, psax pap view
SRT	G-0376	Left Ventricular Fractional Area Change

A.2.32 CID 99200 – Heart Measurements

HD11 uses a private context group CID 99200 to define the concepts for measurements related to heart in general. Following table shows the concepts present in this CID.

CSD	CV	CM
99PMSBLUS	C99200-01	Left Heart Maximum Velocity
99PMSBLUS	C99200-02	Right Heart Maximum Velocity

99PMSBLUS	C99200-03	Left Heart Maximum Diameter
99PMSBLUS	C99200-04	Right Heart Maximum Diameter

A.2.33 CID 99201 – Ductus Arteriosis Measurements

HD11 uses a private context group CID 99201 to define the concepts for measurements related to Ductus Arteriosis. Following table shows the concepts present in this CID.

CSD	CV	CM
99PMSBLUS	C99201-01	Ductus Arteriosis Flow Velocity
99PMSBLUS	C99201-02	Ductus Arteriosis Dimension

A.2.34 Mapping between HD11 measurements and DICOM Concepts.

A.2.34.1 Left Ventricle Measurements

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
LVIDd	Left Ventricle	<csd>LN</csd> <cv>29436-3</cv> <cm>Left Ventricle Internal End Diastolic Dimension</cm>	
LVIDs	Left Ventricle	<csd>LN</csd> <cv>29438-9</cv> <cm>Left Ventricle Internal Systolic Dimension</cm>	
LVPWd	Left Ventricle	<csd>LN</csd> <cv>18152-9</cv> <cm>Left Ventricle Posterior Wall Diastolic Thickness</cm>	
LVPWs	Left Ventricle	<csd>LN</csd> <cv>18156-0</cv> <cm>Left Ventricle Posterior Wall Systolic Thickness</cm>	
IVSd	Left Ventricle	<csd>LN</csd> <cv>18154-5</cv> <cm>Interventricular Septum Diastolic Thickness</cm>	
IVSs	Left Ventricle	<csd>LN</csd> <cv>18158-6</cv> <cm>Interventricular Septum Systolic Thickness</cm>	
LV mean PG	Left Ventricle	<csd>LN</csd> <cv>20256-4</cv> <cm>Mean Gradient</cm>	Finding Site = Left ventricle outflow tract
LV V1 max	Left Ventricle	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Finding Site = Left ventricle outflow tract
LV V1 VTI	Left Ventricle	<csd>LN</csd> <cv>20354-7</cv> <cm>Velocity Time Integral</cm>	Finding Site = Left ventricle outflow tract
EDV (MOD-sp2)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Image Mode = 2D Measurement Method = Method of Disks, Single Plane Image View = Apical two Chamber
EDV (MOD-sp4)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Image Mode = 2D Measurement Method = Method of Disk, Single plane Image View = Apical four Chamber

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
LVAd ap2	Left Ventricle	<csd>SRT</csd> <cv>G-0375</cv> <cm> Left Ventricular Diastolic Area</cm>	Image Mode = 2D Image View = Apical two Chamber Measurement Method = Method of disks, single plane
LVAd ap4	Left Ventricle	<csd>SRT</csd> <cv>G-0375</cv> <cm> Left Ventricular Diastolic Area</cm>	Image Mode = 2D Image View = Apical four Chamber Measurement Method = Method of disks, single plane
LVAd apical	Left Ventricle	<csd>SRT</csd> <cv>G-0375</cv> <cm>Left Ventricular Diastolic Area</cm>	Image Mode = 2D Measurement Method = Method of Disks, Single Plane
LVAd sax epi	Left Ventricle	<csd>SRT</csd> <cv>G-0379</cv> <cm>Left Ventricle Epicardial Diastolic Area, psax pap view</cm>	Image Mode = 2D Image View = Parasternal short axis at the Papillary Muscle level
LVAd sax MV	Left Ventricle	<csd>SRT</csd> <cv>G-0375</cv> <cm>Left Ventricular Diastolic Area</cm>	Image Mode = 2D Image View = Parasternal short axis at the Mitral Valve level
LVAd sax PM	Left Ventricle	<csd>SRT</csd> <cv>G-0375</cv> <cm>Left Ventricular Diastolic Area</cm>	Image Mode = 2D Image View = Parasternal short axis at the Papillary Muscle level
LVAs ap2	Left Ventricle	<csd>SRT</csd> <cv>G-0374</cv> <cm>Left Ventricular Systolic Area</cm>	Image Mode = 2D Image View = Apical two chamber Measurement Method = Method of Disks, Single Plane
LVAs ap4	Left Ventricle	<csd>SRT</csd> <cv>G-0374</cv> <cm>Left Ventricular Systolic Area</cm>	Image Mode = 2D Image View = Apical four chamber Measurement Method = Method of Disks, Single Plane
LVAs apical	Left Ventricle	<csd>SRT</csd> <cv>G-0374</cv> <cm>Left Ventricular Systolic Area</cm>	Image Mode = 2D Measurement Method = Method of Disks, Single Plane
LVAs sax MV	Left Ventricle	<csd>SRT</csd> <cv>G-0374</cv> <cm>Left Ventricular Systolic Area</cm>	Image Mode = 2D Image View = Parasternal short axis at the Mitral Valve level
LVAs sax PM	Left Ventricle	<csd>SRT</csd> <cv>G-0374</cv> <cm>Left Ventricular Systolic Area</cm>	Image Mode = 2D Image View = Parasternal short axis at the Papillary Muscle level
LVLd apical	Left ventricle	<csd>LN</csd> <cv> 18077-8</cv> <cm> Left Ventricle Diastolic Major Axis</cm>	Image Mode = 2D Measurement Method = Method of Disks, Single Plane

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
LVLs apical	Left ventricle	<csd>LN</csd> <cv> 18076-0</cv> <cm> Left Ventricle Systolic Major Axis</cm>	Image Mode = 2D Measurement Method = Method of Disks, Single Plane
LVOT diam	Left ventricle	<csd>SRT</csd> <cv>G-038F</cv> <cm>Cardiovascular Orifice Diameter</cm>	Finding Site = Left ventricle outflow tract Image Mode = 2D
ESV(MOD-sp2)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Image Mode = 2D Image View = Apical two chamber Measurement Method = Method of Disks, Single Plane
ESV(MOD-sp4)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Image Mode = 2D Image View = Apical four chamber Measurement Method = Method of Disks, Single Plane
CO(bp-el)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Biplane Ellipse
CO(Bullet)	Left Ventricle	csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Bullet
CO(Cubed)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Cube
CO(LVOT)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Finding Site = Left ventricle outflow tract
CO(MOD-bp)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Method of Disks, Biplane
CO(mod-Simp)	Left Ventricle	csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Method of Disks, Simpson
CO(MOD-sp2)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Image View = Apical two chamber Measurement Method = Method of Disks, Single Plane
CO(MOD-sp4)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Image View = Apical four chamber Measurement Method = Method of Disks, Single Plane
CO(sp-el)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Method of Disks, Single Plane Ellipse
CO(Teich)	Left Ventricle	<csd>SRT</csd> <cv>F-32100</cv> <cm>Cardiac Output</cm>	Measurement Method = Teichholz

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
EDV(bp-el)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Biplane Ellipse
EDV(Bullet)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Bullet
EDV(Cubed)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Cube
EDV(MOD-bp)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Method of Disks, Biplane
EDV(mod-Simp)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Method of Disks, Simpson
EDV(sp-el)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Single plane Ellipse
EDV(Teich)	Left Ventricle	<csd>LN</csd> <cv>18026-5</cv> <cm>Left Ventricular End Diastolic Volume</cm>	Measurement Method = Teichholz
EF(bp-el)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Biplane Ellipse
EF(Bullet)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Bullet
EF(Cubed)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Cube
EF(MOD-bp)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Method of Disks, Biplane
EF(mod-Simp)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Method of Disk, Simpson

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
EF(MOD-sp2)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Method of Disks, Single plane Image View = Apical two chamber
EF(MOD-sp4)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Method of Disks, Single plane Image View = Apical four chamber
EF(sp-el)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Single plane Ellipse
EF(Teich)	Left Ventricle	<csd>LN</csd> <cv>18043-0</cv> <cm>Left Ventricular Ejection Fraction</cm>	Measurement Method = Teichholz
ESV(bp-el)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Biplane Ellipse
ESV(Bullet)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Bullet
ESV(Cubed)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Cube
ESV(MOD-bp)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Method of Disks, Biplane
ESV(mod-Simp)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Method of Disks, Simpson
ESV(sp-el)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Single plane Ellipse
ESV(Teich)	Left Ventricle	<csd>LN</csd> <cv>18148-7</cv> <cm>Left Ventricular End Systolic Volume</cm>	Measurement Method = Teichholz
FS	Left Ventricle	<csd>LN</csd> <cv>18051-3</cv> <cm>Left Ventricular Fractional Shortening</cm>	

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
Lvmass(AL)d	Left Ventricle	<csd>LN</csd> <cv>18087-7</cv> <cm>Left Ventricle Mass</cm>	Measurement Method = Area Length Single Plane Image Mode = 2D
	Left Ventricle		
Lvmass(C)d	Left Ventricle	<csd>LN</csd> <cv>18087-7</cv> <cm>Left Ventricle Mass</cm>	Measurement Method = Cube Image Mode = 2D
LVMASS(C)dI	Left Ventricle	<csd>LN</csd> <cv>18087-7</cv> <cm>Left Ventricle Mass</cm>	
LVOT Area	Left Ventricle	<csd>SRT</csd> <cv>G-038E</cv> <cm>Cardiovascular Orifice Area</cm>	Finding Site = Left ventricle outflow tract Image Mode = 2D
SV(bp-el)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Biplane Ellipse
SV(Bullet)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Bullet
SV(Cubed)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Cube
SV(LVOT)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Finding Site = Left ventricle outflow tract
SV(MOD-bp)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Method of Disks, Biplane
SV(mod-Simp)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Method of Disks, Simpson
SV(MOD-sp2)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Method of Disks, Single plane. Image View = Apical two chamber
SV(MOD-sp4)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Method of Disks, Single plane. Image View = Apical four chamber
SV(sp-el)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Single plane, Ellipse
SV(Teich)	Left Ventricle	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	Measurement Method = Teichholz

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
IVR Time	Left Ventricle	<csd>LN</csd> <cv>18071-1</cv> <cm>Left Ventricular Isovolumic Relaxation Time</cm>	
MM HR	Left Ventricle	<csd>LN</csd> <cv>8867-4</cv> <cm>Heart rate</cm>	

A.2.34.2 Right Ventricle Measurements

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
RVAWd	Right Ventricle	<csd>LN</csd> <cv>18153-7</cv> <cm>Right Ventricular Anterior Wall Diastolic Thickness</cm>	
RVDd	Right Ventricle	<csd>LN</csd> <cv>20304-2</cv> <cm>Right Ventricular Internal Diastolic Dimension</cm>	
RVOT maxV	Right Ventricle	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Finding Site = Right Ventricle Outflow Tract.
RVSP(TR)	Right Ventricle	<csd>SRT</csd> <cv>G-0380</cv> <cm>Right Ventricular Peak Systolic Pressure</cm>	

A.2.34.3 Aortic Valve Measurements

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
ACS	Aortic Valve	<csd>LN</csd> <cv>17996-0</cv> <cm>Aortic Valve Cusp Separation</cm>	Image Mode = MMode
AI max PG	Aortic Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Regurgitant Flow
AI max vel	Aortic Valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Flow Direction = Regurgitant Flow
Ao V2 VTI	Aortic Valve	<csd>LN</csd> <cv>20354-7</cv> <cm>Velocity Time Integral</cm>	Flow Direction = Antegrade Flow
Ao max PG	Aortic Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Antegrade Flow
Ao mean PG	Aortic Valve	<csd>LN</csd> <cv>20256-4</cv> <cm>Mean Gradient</cm>	Flow Direction = Antegrade Flow

HD11 Label	***Finding Site***	***DICOM Mapping***	***Optional Modifiers***
Ao V2 max	Aortic Valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	
Ao max PG 2	Aortic Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Measurement Method = Simplified Bernoulli
Ao mean PG 2	Aortic Valve	<csd>LN</csd> <cv>20256-4</cv> <cm>Mean Gradient</cm>	Measurement Method = Simplified Bernoulli
AVA (I, D)	Aortic Valve	<csd>SRT</csd> <cv>G-038E</cv> <cm>Cardiovascular Orifice Area</cm>	Measurement Method = Continuity Equation by Velocity Time Integral
AVA (V, D)	Aortic Valve	<csd>SRT</csd> <cv>G-038E</cv> <cm>Cardiovascular Orifice Area</cm>	Measurement Method = Continuity Equation by Velocity Time Integral
Ao dec slope	Aortic Valve	<csd>LN</csd> <cv>20216-8</cv> <cm>Deceleration Slope</cm>	Flow Direction = Antegrade Flow
Ao dec time	Aortic Valve	<csd>LN</csd> <cv>20217-6</cv> <cm>Deceleration Time</cm>	Flow Direction = Antegrade Flow
Aortic HR	Aortic Valve	<csd>LN</csd> <cv>8867-4</cv> <cm>Heart rate</cm>	

A.2.34.4 Aorta Measurements

HD11 Label	***Finding Site***	***DICOM Mapping***	***Optional Modifiers***
Ao root diam	Aorta	<csd>LN</csd> <cv>18015-8</cv> <cm>AorticRoot Diameter</cm>	
Asc Ao	Aorta	<csd>LN </csd> <cv>18012-5</cv> <cm> Ascending Aortic Diameter</cm>	Image Mode = 2D

A.2.34.5 Left Atrium Measurements

HD11 Label	***Finding Site***	***DICOM Mapping***	***Optional Modifiers***
LA dimension	Left Atrium	<csd>LN</csd> <cv>29469-4</cv> <cm>Left Atrium Antero-posterior Systolic Dimension</cm>	
LA/AO	Left Atrium	<csd>LN</csd> <cv>17985-3</cv> <cm>Left Atrium to Aortic Root Ratio</cm>	

A.2.34.6 Mitral Valve Measurements

HD11 Label	Finding Site	***DICOM Mapping***	***Optional Modifiers***
MV E-F slope	Mitral valve	<csd>LN</csd> <cv>18040-6</cv> <cm>Mitral Valve E-F Slope by M-Mode</cm>	Image Mode = MMode
MV excursion	Mitral valve	<csd>99PMSBLUS</csd> <cv>C12207-01</cv> <cm> Mitral Valve D-E Excursion</cm>	Image Mode = MMode
EPSS	Mitral valve	<csd>LN</csd> <cv>18036-4</cv> <cm>Mitral Valve EPSS, E wave</cm>	Image Mode = MMode
MR max PG	Mitral valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Regurgitant Flow
MR max vel	Mitral valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Flow Direction = Regurgitant Flow
MR mean PG	Mitral valve	<csd>LN</csd> <cv>20256-4</cv> <cm>Mean Gradient</cm>	Flow Direction = Regurgitant Flow
MR mean vel	Mitral valve	<csd>LN</csd> <cv>20352-1</cv> <cm>Mean Velocity</cm>	Flow Direction = Regurgitant Flow
MR VTI	Mitral valve	<csd>LN</csd> <cv>20354-7</cv> <cm>Velocity Time Integral</cm>	Flow Direction = Regurgitant Flow

HD11 Label	Finding Site	***DICOM Mapping***	***Optional Modifiers***
MV A point	Mitral valve	<csd>LN</csd> <cv>17978-8</cv> <cm>Mitral Valve A-Wave Peak Velocity</cm>	Flow Direction = Antegrade Flow
MV dec slope	Mitral valve	<csd>LN</csd> <cv>20216-8</cv> <cm>Deceleration Slope</cm>	Flow Direction = Antegrade Flow
MV Max PG	Mitral valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Antegrade Flow
MV Mean PG	Mitral valve	<csd>LN</csd> <cv>20256-4</cv> <cm>Mean Gradient</cm>	Flow Direction = Antegrade Flow
MV P1/2t max v	Mitral valve	<csd>99PMSBLUS</csd> <cv>C12222-03</cv> <cm>Pressure Half-Time Peak velocity</cm>	
MV V2 Max	Mitral valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Flow Direction = Antegrade Flow
MV V2 VTI	Mitral valve	<csd>LN</csd> <cv>20354-7</cv> <cm>Velocity Time Integral</cm>	Flow Direction = Antegrade Flow
MV E point	Mitral valve	<csd>LN</csd> <cv>18037-2</cv> <cm>Mitral Valve E-Wave Peak Velocity</cm>	Flow Direction = Antegrade Flow
MV dec time	Mitral valve	<csd>LN</csd> <cv>20217-6</cv> <cm>Deceleration Time</cm>	Flow Direction = Antegrade Flow
MR alias vel	Mitral valve	<csd>99PMSBLUS</csd> <cv>C12222-02</cv> <cm>Alias Velocity</cm>	Flow Direction = Regurgitant Flow
MR PISA radius	Mitral valve	<csd>99PMSBLUS</csd> <cv>C12222-01</cv> <cm> Flow Radius</cm>	Flow Direction = Regurgitant Flow Image Mode = 2D
MV Diam 1	Mitral valve	<csd>SRT</csd> <cv>G-038F</cv> <cm>Cardiovascular Orifice Diameter</cm>	Image Mode = 2D
MV Diam 2	Mitral valve	<csd>SRT</csd> <cv>G-038F</cv> <cm>Cardiovascular Orifice Diameter</cm>	Image Mode = 2D

HD11 Label	Finding Site	***DICOM Mapping***	***Optional Modifiers***
MR ERO	Mitral Valve	<csd>SRT</csd> <cv>G-038E</cv> <cm>Cardiovascular Orifice Area</cm>	Measurement Method = Proximal Isovelocity Surface area Flow Direction = Regurgitant Flow
MR flow rate	Mitral Valve	<csd>LN</csd> <cv> 34141-2</cv> <cm> Peak Instantaneous Flow Rate</cm>	Flow Direction = Regurgitant Flow
MR PISA	Mitral Valve	<csd>99PMSBLUS</csd> <cv>C12207-06</cv> <cm>Mitral Valve Flow Area</cm>	Measurement Method = Proximal Isovelocity Surface area Flow Direction = Regurgitant Flow
MR RF	Mitral Valve	<csd>SRT</csd> <cv>G-0390-4</cv> <cm>Regurgitant Fraction</cm>	Flow Direction = Regurgitant Flow
MR volume	Mitral Valve	<csd>LN</csd> <cv>33878-0</cv> <cm>Volume Flow</cm>	Measurement Method = Proximal Isovelocity Surface area Flow Direction = Regurgitant Flow
MV E/A	Mitral Valve	<csd>LN</csd> <cv>18038-0</cv> <cm>Mitral Valve E to A Ratio</cm>	
MV Flow Area	Mitral Valve	<csd>99PMSBLUS</csd> <cv>C12207-06</cv> <cm>Mitral Valve Flow Area </cm>	Measurement Method = Proximal Isovelocity Surface area Image Mode = 2D
MV P1/2t	Mitral Valve	<csd>LN</csd> <cv>20280-4</cv> <cm>Pressure Half-Time</cm>	
SV(MV)	Mitral Valve	<csd>SRT</csd> <cv>F-32120</cv> <cm>Stroke Volume</cm>	
MVA P1/2t	Mitral Valve	<csd>SRT</csd> <cv>G-038E</cv> <cm>Cardiovascular Orifice Area</cm>	Measurement Method = Area by PHT

A.2.34.7 Pulmonic Valve Measurements

HD11 Label	***Finding Site***	***DICOM Mapping***	***Optional Modifiers***
Q-to-PV close	Pulmonic Valve	<csd>LN</csd> <cv>20295-2</cv> <cm>Time from Q wave to Pulmonic Valve Closes</cm>	Image Mode = MMode
PA acc time	Pulmonic Valve	<csd>LN</csd> <cv>20168-1</cv> <cm>Acceleration Time</cm>	Flow Direction = Antegrade Flow

HD11 Label	***Finding Site***	***DICOM Mapping***	***Optional Modifiers***
PA dec slope	Pulmonic Valve	<csd>LN</csd> <cv>20216-8</cv> <cm>Deceleration Slope</cm>	
PA dec time	Pulmonic Valve	<csd>LN</csd> <cv>20217-6</cv> <cm>Deceleration Time</cm>	
PA max PG	Pulmonic Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Antegrade Flow
PA mean PG	Pulmonic Valve	<csd>LN</csd> <cv>20256-4</cv> <cm>Mean Gradient</cm>	Flow Direction = Antegrade Flow
PA V2 max	Pulmonic Valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Flow Direction = Antegrade Flow
PI max PG	Pulmonic Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Regurgitant Flow
PI max vel	Pulmonic Valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Flow Direction = Regurgitant Flow
PA dec slope	Pulmonic Valve	<csd>LN</csd> <cv>20216-8</cv> <cm>Deceleration Slope</cm>	
PA P1/2t	Pulmonary Valve	<csd>LN</csd> <cv>20280-4</cv> <cm>Pressure Half-Time</cm>	

A.2.34.8 Tricuspid Valve Measurements

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
Q-to-TV open	Tricuspid Valve	<csd>LN</csd> <cv>20296-0</cv> <cm>Time from Q wave to Tricuspid Valve Opens</cm>	Image Mode = MMode
TR max vel	Tricuspid Valve	<csd>LN</csd> <cv>11726-7</cv> <cm>Peak Velocity</cm>	Flow Direction = Regurgitant Flow
TV max PG	Tricuspid Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Antegrade Flow
TV mean vel	Tricuspid Valve	<csd>LN</csd> <cv>20352-1</cv> <cm>Mean Velocity</cm>	Flow Direction = Antegrade Flow
TR Max PG	Tricuspid Valve	<csd>LN</csd> <cv>20247-3</cv> <cm>Peak Gradient</cm>	Flow Direction = Regurgitant Flow

A.2.34.9 General Heart Measurements

HD11 Label	*Finding Site*	*DICOM Mapping*
Left max vel	Left Heart	<csd>99PMSBLUS</csd> <cv>C99200-01</cv> <cm>Left Heart Maximum Velocity</cm>
Right max vel	Right Heart	<csd>99PMSBLUS</csd> <cv>C99200-02</cv> <cm>Right Heart Maximum Velocity</cm>
Left diam	Left Heart	<csd>99PMSBLUS</csd> <cv>C99200-03</cv> <cm>Left Heart Diameter</cm>
Right diam	Right Heart	<csd>99PMSBLUS</csd> <cv>C99200-04</cv> <cm>Right Heart Diameter</cm>

A.2.34.10 Ductus Arteriosis Measurements

HD11 Label	*Finding Site*	*DICOM Mapping*	*Optional Modifiers*
Duct Art	Patent Ductus Arteriosis	<csd>99PMSBLUS</csd> <cv>C99201-02</cv> <cm>Ductus Arteriosis Dimension</cm>	Image Mode = 2D
Duct Art Flow	Patent Ductus Arteriosis	<csd>99PMSBLUS</csd> <cv>C99201-01</cv> <cm>Ductus Arteriosis Flow Velocity</cm>	

A.2.35 Mapping between HD11 Wall Segment Scores and DICOM

DICOM uses ASE based Wall Segment scores in the template where Wall Motion Analysis data is given. HD11 provides Wall Segment scoring based on ASE scheme also. Below table shows the mapping between ASE Wall Segment scores and the DICOM.

Mercury ASE Segment Score Name	*DICOM Mapping*
UNREAD	<csd>SRT</csd> <cv> R-00378</cv> <cm> Not Evaluated</cm>
CANNOT_READ	<csd>DCM</csd> <cv> 122288</cv> <cm> Not visualized</cm>
NORMAL	<csd>SRT</csd> <cv>R-00344</cv> <cm> Normal wall motion</cm>
HYPOKINETIC	<csd>SRT</csd> <cv>R-4041B</cv> <cm> Hypokinesis</cm>
AKINETIC	<csd>SRT</csd> <cv>F-30004</cv> <cm>Akinesis</cm>
DYSKINETIC	<csd>SRT</csd> <cv> F-32052</cv> <cm>Dyskinesis</cm>
ANEURYSMAL	<csd>SRT</csd> <cv>D3-10510</cv> <cm>Ventricular Aneurysm</cm>

A.2.36 Mapping between HD11 Wall Segment Names and DICOM

HD11 uses 16 segment based assessment and below table shows the mapping of the 16 segments to the DICOM.

Mercury Segment Name	***DICOM Mapping***
Basal Anterior	<csd>SRT</csd> <cv>T-32619</cv> <cm> left ventricle basal anterior segment</cm>
Basal Anterolateral wall	<csd>SRT</csd> <cv>R-1007A</cv> <cm>left ventricle basal anterolateral segment</cm>
Basal Posterolateral wall	<csd>SRT</csd> <cv>R-10079</cv> <cm>left ventricle basal inferolateral segment</cm>
Basal Inferior Wall	<csd>SRT</csd> <cv>T-32615</cv> <cm> left ventricle basal inferior segment</cm>
Basal Inferior Septum	<csd>SRT</csd> <cv>R-10076</cv> <cm>left ventricle basal inferoseptal segment</cm>
Basal Anterior Septum	<csd>SRT </csd> <cv> R-10075</cv> <cm>left ventricle basal anteroseptal segment</cm>
Mid-Anterior Wall	<csd>SRT</csd> <cv>T-32617</cv> <cm>left ventricle mid anterior segment</cm>
Mid-Anterolateral Wall	<csd>SRT </csd> <cv>R-1007C</cv> <cm>left ventricle mid anterolateral segment</cm>
Mid-Posterolateral Wall	<csd>SRT</csd> <cv>R-1007B</cv> <cm>left ventricle mid inferolateral segment</cm>
Mid-Inferior Wall	<csd>SRT</csd> <cv>T-32616</cv> <cm> left ventricle mid inferior segment</cm>
Mid-Inferior Septum	<csd>SRT</csd> <cv>R-10078</cv> <cm>left ventricle mid inferoseptal

Mercury Segment Name	*DICOM Mapping*
	segment</cm>
Mid-Anterior Septum	<csd>SRT</csd> <cv>R-10077</cv> <cm> left ventricle mid anteroseptal segment</cm>
Apical Anterior Wall	<csd>SRT</csd> <cv> T-32613</cv> <cm> left ventricle apical anterior segment</cm>
Apical Lateral Wall	<csd>SRT</csd> <cv>T-3261C</cv> <cm>left ventricle apical lateral segment</cm>
Apical Inferior Wall	<csd>SRT</csd> <cv>T-32618</cv> <cm> left ventricle apical inferior segment</cm>
Apical Septum	<csd>SRT</csd> <cv>T-32614</cv> <cm>left ventricle apical septal segment</cm>

A.2.37 Not mapped measurements in HD11

HD11 Label	*DICOM Mapping*
Aortic R-R	Not Mapped
MM R-R int	Not Mapped
Annular Vel	Not Mapped
Myocardial Vel	Not Mapped
EDA	Not Mapped
ESA	Not Mapped
LVLd % diff	Not Mapped
LVLs % diff	Not Mapped
Lvmass(AL)dI	Not Mapped
Lvmass(C)dI	Not Mapped
Pul V D	Not Mapped
Pul V S	Not Mapped

HD11 Label	*DICOM Mapping*
Pul V A wave max	Not Mapped.
FAC	Not Mapped.

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