
DICOM

Conformance Statement

iE33 Release 1.1.x.x

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REVISION HISTORY

Document Version	Author	Description
A	M. Leif	<p>Initial Release for iE33 1.1. Derived from the iE33 1.0 DCS with extensive changes to Echo and Vascular SR sections, the addition of new private codes.</p> <p>Changes to Table 84, 85 and 86.</p> <p>Changed Table 82 to refer only to US objects, not US MF objects</p> <p>Incorporated changes to TDI measurements and calculations, added two Mitral Valve Measurements and several missing Optional Modifiers</p> <p>Removed retired Private Codes from Echo SR tables.</p> <p>Removed unneeded Context tables from Vascular SR and removed unused codes.</p>
B	J. Vasil	<p>Added date of document to cover page and made minor formatting changes to improve readability of PDF version.</p>

1 CONFORMANCE STATEMENT OVERVIEW

iE33 implements the necessary DICOM® services to download worklists from an information system, save acquired US images and associated Structured Reports to a network storage device, CD or DVD, 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 1
NETWORK SERVICES**

Networking SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Image Transfer		
Ultrasound Image Storage	Yes	No
Ultrasound Multiframe Image Storage	Yes	No
Storage Commitment Push Model	Yes	No
Private 3D Presentation State	Yes	No
Structured Report Transfer		
Comprehensive SR	Yes	No
Workflow		
Modality Worklist	Yes	No
Print		
Basic Grayscale Print Management	Yes	No
Basic Color Print Management	Yes	No
General		
Verification	Yes	Yes

Table 2 specifies the Media Storage Application Profiles supported.

**Table 2
MEDIA SERVICES**

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
DVD-Rewriteable		
STD-US-SC-SF-DVD	Yes / Yes	Yes ⁽¹⁾⁽²⁾
STD-US-SC-MF-DVD	Yes / Yes	Yes ⁽¹⁾⁽²⁾

(1) Structured Reports and some image formats (e.g. Native Data, 3D Volume Data, and 3D Subpages) cannot be imported.

(2) Only reads and imports data from other Philips iE33 and iU22 systems.

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3 INTRODUCTION

3.1 AUDIENCE

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.2 REMARKS

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Philips Medical Systems and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity between Philips Medical Systems and non - Philips Medical Systems equipment.
- Test procedures should be defined to validate the desired level of connectivity.
- The DICOM standard will evolve to meet the users' future requirements. Philips Medical Systems is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

3.3 DEFINITIONS, TERMS AND ABBREVIATIONS

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ASCE	Association Control Service Element
CD-R	Compact Disk Recordable
CSE	Customer Service Engineer
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDf	Grayscale Standard Display Function
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
MSPS	Modality Scheduled Procedure Step

MWL	Modality Worklist
R	Required Key Attribute
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
PDE	Patient Data Entry
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM server)
SOP	DICOM Service-Object Pair
U	Unique Key Attribute
US	Ultrasound
VistA	Veterans Health Information Systems and Technology Architecture

3.4 REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), NEMA PS 3.1-3.18, 2004

DICOM Correction Item CP-499 More Ultrasound Vascular Terms, Final Text version, January 1, 2005

VistA DICOM Conformance Requirements for Image Acquisition Modalities in Radiology and Other Specialties, Department of Veterans Affairs, version 2.3 January 3, 2003

DICOM Conformance Statements for other Philips Medical Systems products, including the 1.0 release of the iE33, are available on the Philips web site at <http://www.medical.philips.com/main/company/connectivity>.

4 NETWORKING

4.1 IMPLEMENTATION MODEL

4.1.1 Application Data Flow

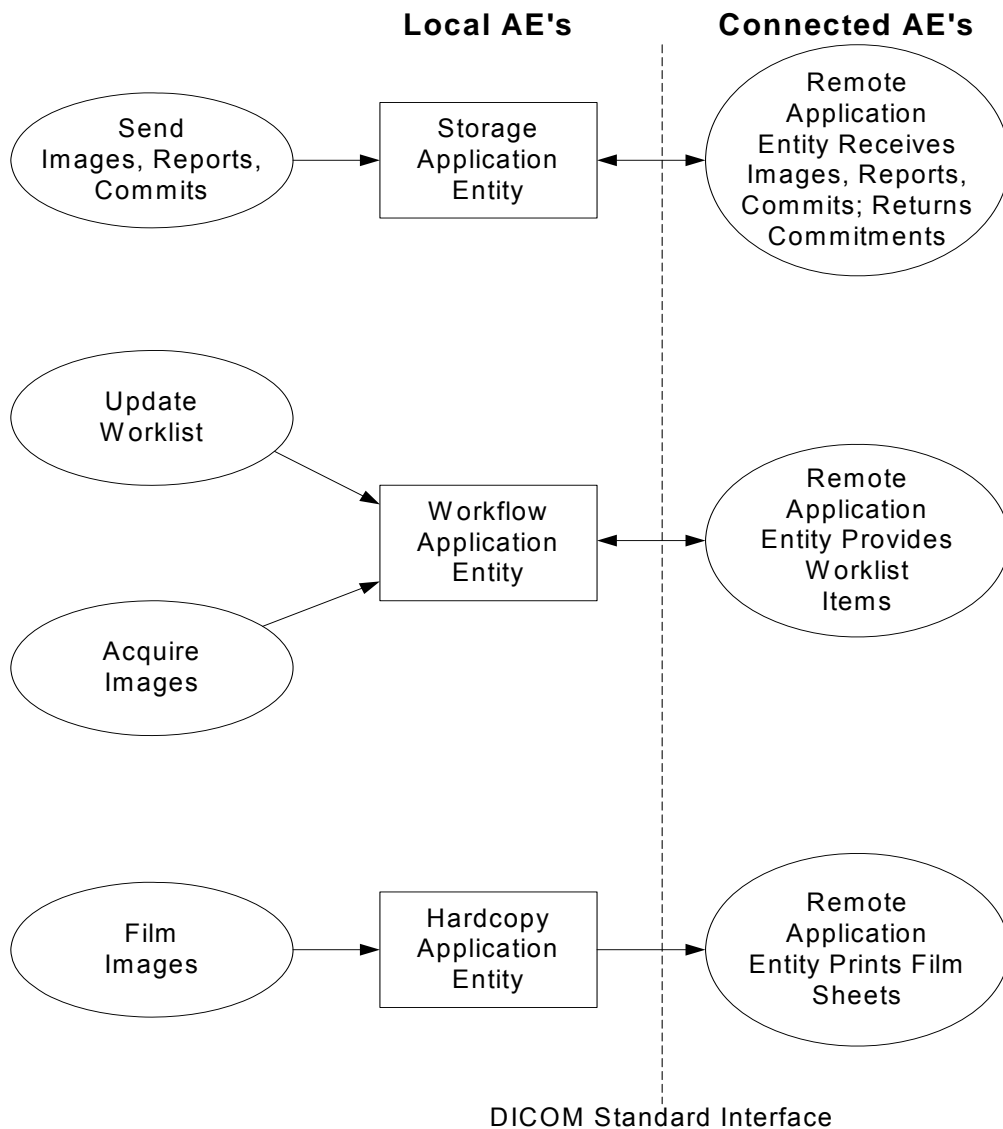


Figure 1
APPLICATION DATA FLOW DIAGRAM

- The Storage Application Entity sends images and Structured Reports to a remote AE. It is associated with the local real-world activity "Acquire" for single frame and Multiframe or Cineloops. A single frame is sent if the control panel FREEZE key is pressed first. Alternately, the user may select "Acquire Frame" from the left touch screen. Loops may also be acquired using the "Acquire Loop" key on the left touch

screen. Sending of images depends on user configuration, either “After Each Print/Acquire” or “At End of Exam.” Sending Structured Reports occurs only at End of Exam. A Structured Report will be sent with an exam when the exam is selected from the Patient Directory using “Review”. If configured for After Each, images are transferred immediately after acquisition, and the association is closed. If the remote AE is configured as an archive device, the Storage AE will request Storage Commitment and if a commitment is successfully obtained, will record this information in the local database, signaling the Auto-delete function that the exam qualifies for deletion.

- The Workflow Application Entity receives Worklist information from a remote AE. It is associated with the local real-world activities “Update Worklist”. When the “Update Worklist” local real-world activity is performed, the Workflow Application Entity queries a remote AE for worklist items and provides the set of worklist items matching the query request. “Update Worklist” is performed as a result of an operator request or can be performed automatically at specific time intervals.
- The Hardcopy Application Entity prints images on a remote AE (Printer). It is associated with the local real-world activity “Acquire Frame”. “Acquire Frame” creates a print queue containing one or more virtual film sheets composed from images acquired by the user. It creates and sends fully rendered pages, already containing the user’s selected formatting choices. Only a single image per sheet is sent to the printer. This print object may be very large.
- Exam data is sent to all selected Store, Print and media destinations simultaneously in accordance with system configuration of “After Each Print/Acquire” or “At End of Exam”, with the exception of Structured Reports, which only are sent at End of Exam. When exams are selected for export from Patient Directory, the user may select specific destinations from the list of configured devices.

4.1.2 Functional Definition of AEs

4.1.2.1 Functional Definition of Storage Application Entity

The existence of a Network Store queue with associated network destination will activate the Storage AE. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context the image transfer is started. If the association cannot be opened, the related queue is set to a “Failed” state, indicated by a Red dot on the Network Icon, and can be restarted by the user via the queue management interface.

Store Maximums: Number of exams on the system = 200*

 Number of Frames in cineloop = 1000

* Unless system hard drive capacity is exceeded first

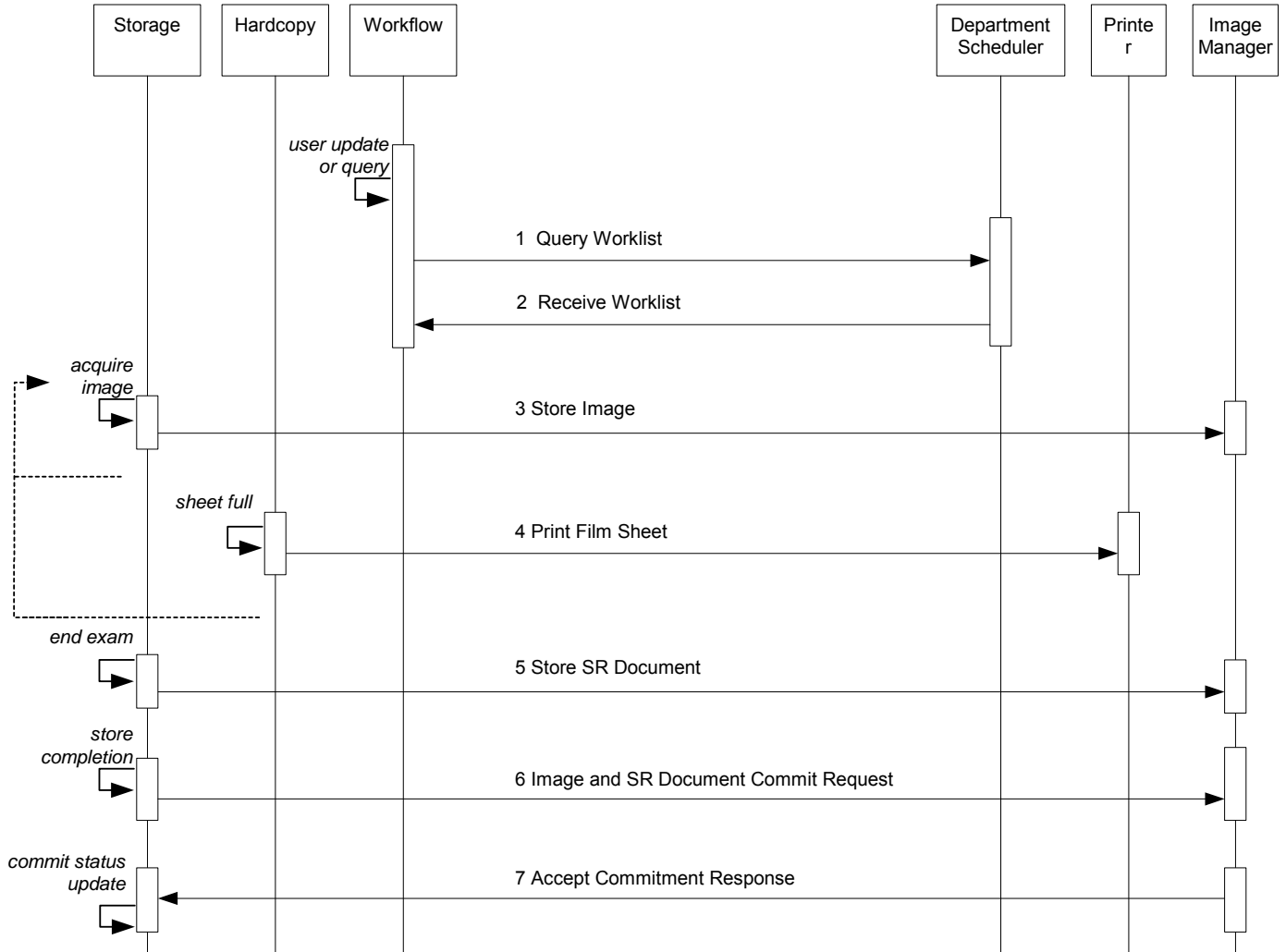
4.1.2.2 Functional Definition of Workflow Application Entity

Update Worklist attempts to download a Modality Worklist from a Modality Worklist server with studies matching US for ultrasound and the current date. If the Workflow AE establishes an Association to a remote AE, it will transfer all worklist items via the open Association. The results of a successful Worklist Update will overwrite the data in the Worklist display. If no matches are returned, the current patient list will not be changed. Specific queries for Patient Last Name, Patient ID, Accession #, Date, and Requested Procedure ID may be performed using the Patient Search. There is no queue management for Worklist.

4.1.2.3 Functional Definition of Hardcopy Application Entity

The existence of a print queue will activate the Hardcopy AE. An association is established with the printer(s) and the printer’s status determined. If the printer is operating normally, the film sheets will be printed. Changes in printer status will be detected (e.g. out of film) and reported to the user. If the printer is not operating normally, the print queue will set to a “Failed” state and can be restarted by the user via the queue management interface.

4.1.3 Sequencing of Real-World Activities



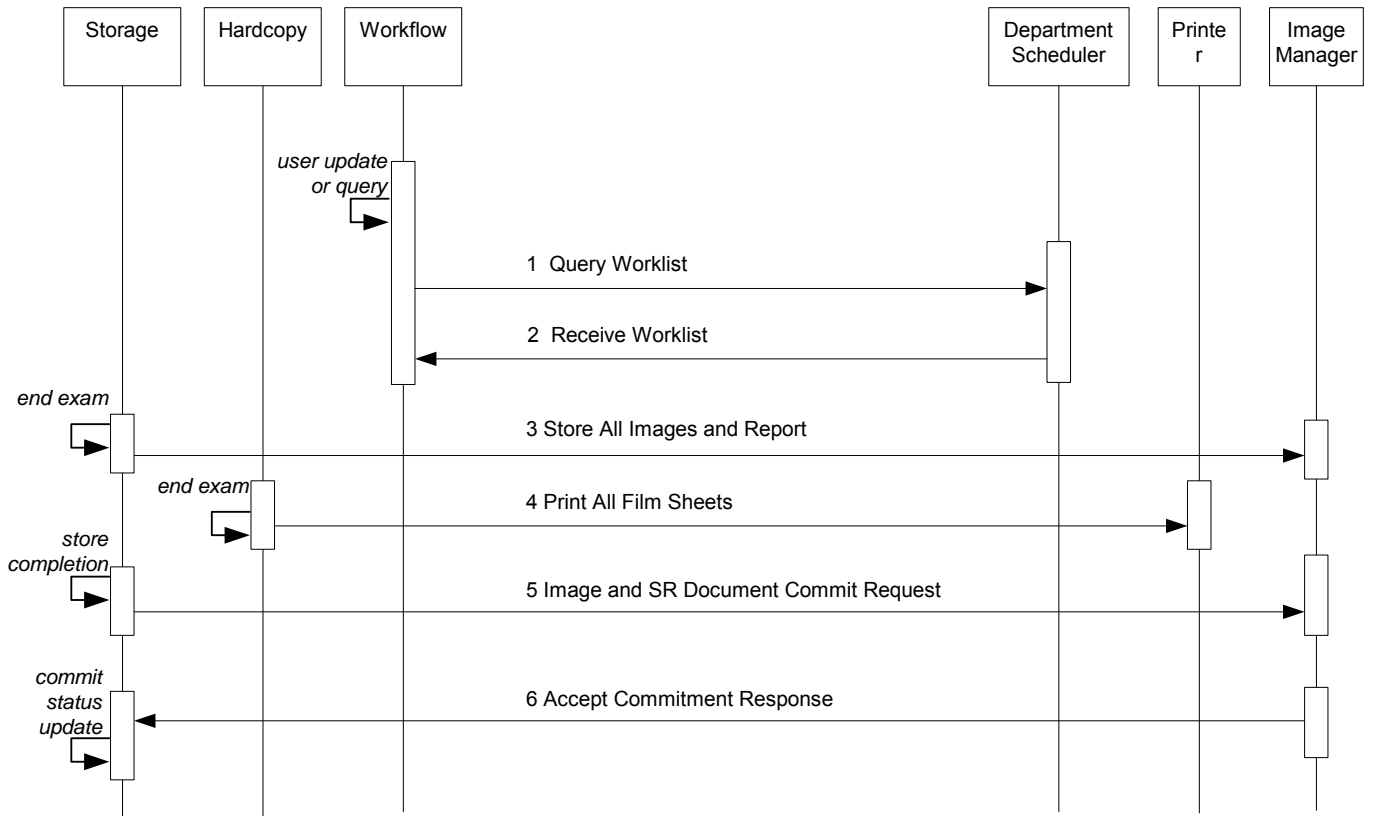
**Figure 2a:
SEQUENCING CONSTRAINTS – “AFTER EACH” CONFIGURATION**

Figures 2a and 2b illustrate normal scheduled workflow conditions.

Notes:

- Printing to DICOM printers may occur independent of any other DICOM activity.
- All selected store, print and DVD devices will be sent data during the exam when configured for sending “After Each Print/Acquire” or at “At End of Exam.”
- Selecting a study from Review for export will send to all selected devices.

Other workflow situations (e.g. unscheduled procedure steps) will have other sequencing constraints. Printing or storage could equally take place after image acquisition. Printing could be omitted completely if no printer is connected or hardcopies are not required.



**Figure 2b:
SEQUENCING CONSTRAINTS – “END OF EXAM” CONFIGURATION**

4.2 AE SPECIFICATIONS

4.2.1 Storage Application Entity Specification

4.2.1.1 SOP Classes

iE33 provides Standard Conformance to the following SOP Classes:

**Table 3
SOP CLASSES FOR AE STORAGE**

SOP Class Name	SOP Class UID	SCU	SCP
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	No
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No
Private 3D Presentation State*	1.3.46.670589.2.5.1.1	Yes	No

* See [Section 8.6.2](#) for details on this Private SOP Class.

4.2.1.2 Association Establishment Policy

4.2.1.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

**Table 4
DICOM APPLICATION CONTEXT FOR AE STORAGE**

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.1.2.2 Number of Associations

iE33 initiates one Association at a time for each destination to which a transfer request is being processed in the active job queue list. Three 'Archive' destinations may be selected simultaneously, but only one job will be active at a time, the other(s) remain pending until the active job is completed or failed.

**Table 5
NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE**

Maximum number of simultaneous Associations	5
---	---

1 for each configured storage device 1 for each store destination, 1 Structured Report and 1 Storage Commitment

iE33 accepts Associations for N-EVENT-REPORT notifications for the Storage Commitment Push Model SOP Class.

**Table 6
NUMBER OF ASSOCIATIONS ACCEPTED FOR AE STORAGE**

Maximum number of simultaneous Associations	1
---	---

4.2.1.2.3 Asynchronous Nature

iE33 does not support asynchronous communication (multiple outstanding transactions over a single Association).

**Table 7
ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE**

Maximum number of outstanding asynchronous transactions	1
---	---

4.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 8
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Store Images, Loops and Structured Reports

4.2.1.3.1.1 Description and Sequencing of Activities

A user can select exams or individual images from Review and request them to be sent to multiple destinations (up to 3). Reports may not be selected individually, but are sent when “End Exam” is pressed, and when an entire study is selected from the Review Directory. Each object (single frame, Multiframe, 3D, report) is entered into the job queue. When the “Send After Each Print/Capture” option is active, the queue is serviced continuously during the exam. There is a default 10-minute timeout for “Send After Each,” after which the association is closed. Any additional images acquired during the exam will be sent on a subsequent association.

The Network Status icon reports the status of the job, Green is ok, Yellow is paused, and Red is failed. If the C-STORE Response from the remote Application contains a status other than Success or Warning, the Association is aborted and the related Job is switched to a failed state. It can be restarted any time by user interaction. When a system configured with selected network destinations is used without the network connected, it is considered in “Portable” mode. Each network status Icon will be Yellow with status of “Pending” for each study acquired while the network was not connected. When returning from portable, reconnecting the network cable will initiate transfer beginning again.

If a device is configured for Storage Commitment service, the Storage AE will, after all images and reports have been sent, transmit a single Storage Commitment request (N-ACTION) over a separate Association. The Storage AE can only receive an N-EVENT-REPORT request in a subsequent association initiated by the SCP employing PDU 54H SCP/SCU Role Negotiation in the SCP’s Association Request.

Multiframe objects (cineloops) will not be stored for imaging modes that include scrolling data, i.e., spectral Doppler or Mmode displays.

All supported measurements and calculations created by iE33 will be exported even if they are not selected for display in the iE33 report. Measurements or calculations that are not supported for export are listed in Appendix A and B in the Mapping Tables for each report and indicated by “Not Mapped”

Echo measurements generate an Adult Echocardiography Procedure report; Vascular measurements generate a Vascular SR report.

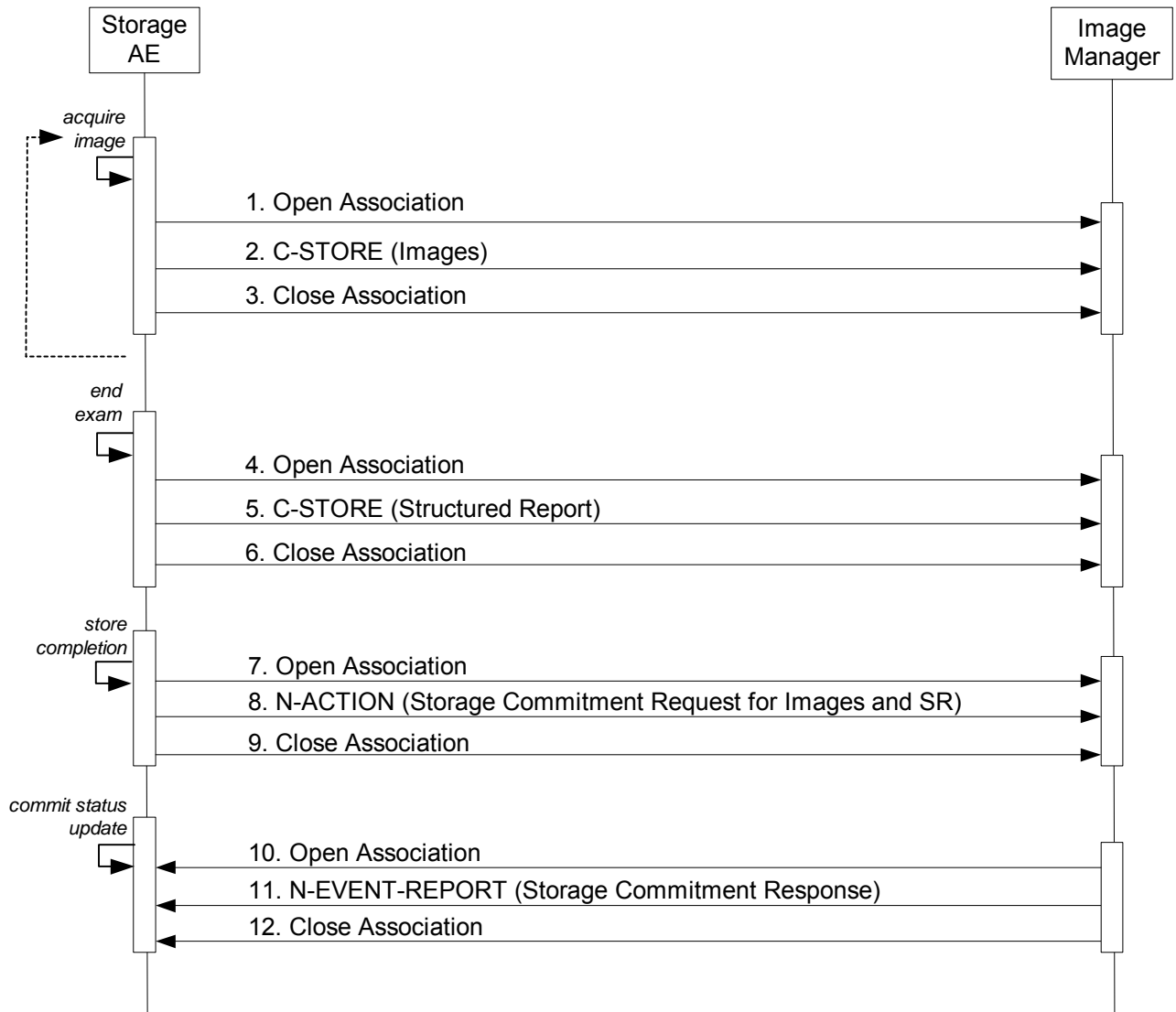


Figure 3
SEQUENCING OF ACTIVITY – SEND IMAGES

The sequence of interactions between the Storage AE and an Image Manager is illustrated in Figure 3 for the “Store” configuration option “After Each.” The alternative option, “End Exam” differs only in the removal of the loop symbol on the ‘acquire images’ activity

NOTE: Message sequences vary depending on the relative time of the SCP AE’s. The N-EVENT-REPORT can also be sent over a separate association initiated by the Image Manager (see Section 4.2.1.4.1 on Activity – Receive Storage Commitment Response).

4.2.1.3.1.2 Proposed Presentation Contexts

iE33 is capable of proposing the Presentation Contexts shown in the following table:

**Table 9
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND IMAGES**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
US Multiframe Image Storage*	1.2.840.10008.5.1.4.1.1.3.1	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossy Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.50	SCU	None
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None
Private 3D Presentation State**	1.3.46.670589.2.5.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

* Loops will be YBR_FULL_422 unless “Uncompressed” is selected in setups, which will produce RGB loops.

** Intended for use only on QLAB and Xcelera workstations.

Presentation Contexts are proposed for each Archive device based on selected options. Storage Commitment N-Action Requests will only be sent to a device that is also configured as the Storage Commitment server, and a target archive is selected that images are sent to.

“Target Archive” is one of the three possible archives that images are sent to. “Commit Server” may be the same device but must be configured in Global Config/Devices.

4.2.1.3.1.3 SOP Specific Conformance for Image and Comprehensive Structured Report Storage SOP Classes

All Image and Comprehensive Structured Report Storage SOP Classes supported by the Storage AE exhibit the same behavior, except where stated, and are described together in this section.

Table 10 describes C-Store response behavior.

**Table 10
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOR**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP successfully stored the SOP Instance. If all SOP Instances succeed, the job is marked as complete.
*	*	Any other status code.	The Association is aborted using A-ABORT and the transfer fails. The status is logged.

The behavior of Storage AE during communication failure is summarized in Table 11.

**Table 11
STORAGE COMMUNICATION FAILURE BEHAVIOR**

Exception	Behavior
Timeout	Same as Service Status "Refused" in Table 10 above.
Association aborted by the SCP or network layers	Same as Service Status "Refused" in Table 10 above.

A green dot on the Network Transfer Icon indicates a successful transfer or an active queue. A red dot indicates failure. By using the Queue Manager, the user can restart a failed transfer. Open the Queue Manager by clicking on the Network Transfer Icon. Select the failed transfer and click Resume.

The contents of US Image, US Multiframe Storage and Comprehensive Structured Report Storage SOP Instances conform to the DICOM IOD definitions described in section 8.1.

4.2.1.3.1.4 SOP Specific Conformance for Storage Commitment Push Model SOP Class

4.2.1.3.1.4.1 Storage Commitment Operations (N-ACTION)

The Storage AE will request storage commitment for the configured device.

Table 12 summarizes the behavior of Storage AE when receiving response status codes.

**Table 12
STORAGE COMMITMENT N-ACTION RESPONSE STATUS HANDLING BEHAVIOR**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The system waits for the N-Event-Report.
*	*	Any other status code.	Retry The commit status remains incomplete for all objects.

Table 13 summarizes the behavior of Storage AE during communication failure.

**Table 13
STORAGE COMMITMENT COMMUNICATION FAILURE BEHAVIOR**

Exception	Behavior
Timeout	Same as non-success status in Table 12.
Association aborted by the SCP or network layers	Same as non-success status in Table 12.

4.2.1.3.1.4.2 Storage Commitment Notifications (N-EVENT-REPORT)

The Storage AE can receive an N-EVENT-REPORT notification received from the SCP via Reverse-role negotiation.

If no N-EVENT-REPORT is received after a ten-minute time-out, the transaction is treated as a failure

Table 14 summarizes the behavior of Storage AE when receiving Event Types within the N-EVENT-REPORT.

**Table 14
STORAGE COMMITMENT N-EVENT-REPORT BEHAVIOUR**

Event Type Name	Event Type ID	Behavior
Storage Commitment Request Successful	1	The commit status is set to complete for each object.

Storage Commitment Request Complete – Failures Exist	2	The commit status remains incomplete. The commit comment for each object is logged.
--	---	---

The reasons for returning specific status codes in a N-EVENT-REPORT response are summarized in Table 15.

**Table 15
STORAGE COMMITMENT N-EVENT-REPORT RESPONSE STATUS REASONS**

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The storage commitment result has been successfully received.
Failure	Unrecognized Operation	0211H	The Transaction UID was not sent in an N-ACTION request.
Failure	Resource Limitation	0213H	The Transaction UID has expired.
Failure	No Such Event Type	0113H	Invalid Event Type ID supplied.
Failure	Processing Failure	0110H	Internal error during processing. Error Comment (0000,0902) contains a short description.
Failure	Invalid Argument Value	0115H	The unrecognized SOP Instance UIDs will be returned within the Event Information of the N-EVENT-REPORT response.

4.2.1.4 Association Acceptance Policy

4.2.1.4.1 Activity – Receive Storage Commitment Response

4.2.1.4.1.1 Description and Sequencing of Activities

The Storage AE accepts associations for pending responses to a Storage Commitment Request.

4.2.1.4.1.2 Accepted Presentation Contexts

Table 17 summarizes Presentation Contexts that the Storage AE accepts.

**Table 17
ACCEPTABLE PRESENTATION CONTEXTS FOR
ACTIVITY RECEIVE STORAGE COMMITMENT RESPONSE**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.1.4.1.3 SOP Specific Conformance for Storage Commitment Push Model SOP Class

4.2.1.4.1.3.1 Storage Commitment Notifications (N-EVENT-REPORT)

Upon receipt of a N-EVENT-REPORT the timer associated with the Transaction UID will be canceled.

Table 14 summarizes the behavior of Storage AE when receiving Event Types within the N-EVENT-REPORT.

Table 15 summarizes the reasons for returning specific status codes in a N-EVENT-REPORT response.

4.2.2 Workflow Application Entity Specification

4.2.2.1 SOP Classes

iE33 provides Standard Conformance to the following SOP Classes:

Table 18
SOP CLASSES FOR AE WORKFLOW

SOP Class Name	SOP Class UID	SCU	SCP
MWL Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

4.2.2.2 Association Establishment Policy

4.2.2.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 19
DICOM APPLICATION CONTEXT FOR AE WORKFLOW

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.2.2.2 Number of Associations

iE33 initiates one Association at a time for a Worklist request.

Table 20
NUMBER OF ASSOCIATIONS INITIATED FOR AE WORKFLOW

Maximum number of simultaneous Associations	1
---	---

4.2.2.2.3 Asynchronous Nature

iE33 does not support asynchronous communication.

Table 21
ASYNCHRONOUS NATURE AS A SCU FOR AE WORKFLOW

Maximum number of outstanding asynchronous transactions	1
---	---

4.2.2.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 22
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE WORKFLOW

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – Worklist Update

4.2.2.3.1.1 Description and Sequencing of Activities

Two events may initiate worklist queries for Modality (US) only:

- User may key “Update Worklist” or ”Patient Search...” and enter matching fields to start a query: Patient Name, Patient ID, Accession #, Exam Date or Requested Procedure ID
- The system may periodically update with a configurable time interval (between 15 and 120 minutes at 15 minute increments), Current Date and configured query fields: System AE Title, Station Name, and System Location

The user at may cancel a worklist update anytime between sending the update request and receiving the final response.

“Update Worklist” sends:
Modality = US and Current Date

“Patient Search,,,” sends:
Modality = US and any combination of
Last Name (Wild Card (*) or Matching
Leading Letters)
Patient ID (Exact Match)
Accession # (Exact Match)
Exam Date (Exact Match)
Requested Procedure ID (Exact Match)

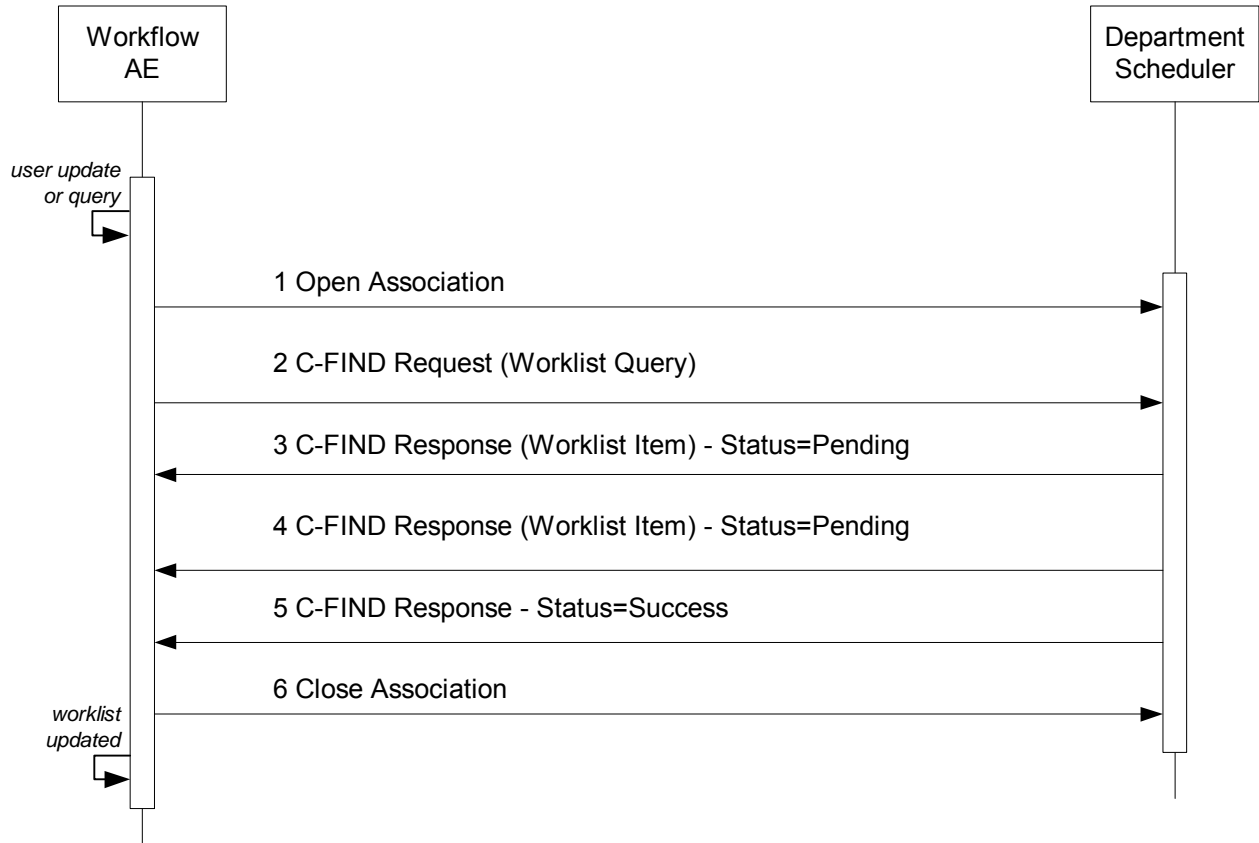


Figure 5
SEQUENCING OF ACTIVITY – WORKLIST UPDATE

A possible sequence of interactions between the Workflow AE and a Departmental Scheduler (e.g. a device such as a RIS or HIS which supports the MWL SOP Class as an SCP) is illustrated in Figure 5:

4.2.2.3.1.2 Proposed Presentation Contexts

iE33 will propose Presentation Contexts as shown in the following table:

Table 23
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY WORKLIST UPDATE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

4.2.2.3.1.3 SOP Specific Conformance for Modality Worklist

Table 24 summarizes the behavior of iE33 when encountering status codes in a MWL C-FIND response.

A message “query failed” will appear on the user interface if iE33 receives any other SCP response status than “Success” or “Pending.”

Table 24
MODALITY WORKLIST C-FIND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The system replaced the worklist from the response.
Pending	Matches are continuing	FF00	Continue.
Pending	Matches are continuing – Warning that one or more Optional Keys were not supported	FF01	Continue.
*	*	Any other status code.	The Association is aborted using A-ABORT. The worklist is not replaced.

Table 25 summarizes the behavior of iE33 during communication failure.

Table 25
MODALITY WORKLIST COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as Service Status “*” in the table above.
Association aborted by the SCP or network layers	Same as Service Status “*” in the table above.

Table 26 describes the iE33 Worklist Matching Keys and requested attributes. Unexpected attributes returned in a C-FIND response are ignored.

Non-matching responses returned by the SCP due to unsupported optional matching keys are ignored.

Patient Medical							
Medical Alerts	(0010,2000)	LO					
Additional Patient's History	(0010,21B0)	LT		x			x
Pregnancy Status	(0010,21C0)	US		x			x
Last Menstrual Date	(0010,21D0)	DA					

X* = Additionally mapped to "Study ID" (0020,0010) in Composite Objects

The above table should be read as follows:

Module Name: The name of the associated module for supported worklist attributes.

Attribute Name: Attributes supported to build an iE33 Worklist Request Identifier.

Tag: DICOM tag for this attribute.

VR: DICOM VR for this attribute.

M: Matching keys for (automatic) Worklist Update. An "S" indicates that iE33 supplies an attribute value for Single Value Matching or additional specific tags indicated by "(S)". See ¹ below.

R: Return keys. An "x" indicates that iE33 supplies this attribute as a Return Key with zero length for Universal Matching.

Q: Interactive Query Key. An "x" indicates that iE33 supplies this attribute as matching key, if entered in the Patient Search dialog.

D: Displayed keys. An "x" indicates that this worklist attribute is displayed to the user in the Worklist tab of the Patient Data screen.

IOD: An "x" indicates that this Worklist attribute is included into all Object Instances created during performance of the related Procedure Step.

¹ Entered in Global Configuration – System tab, "AE Title", selected in Device Selection – Worklist tab, Define Query section

² From Patient Search tab in Patient Data Entry – "Exam Date" field

³ Fixed at "US"

⁴ From Global Configuration – System tab, "Station Name", selected in Device Selection – Worklist tab, Define Query section

⁵ From Global Configuration – System tab, "System Location", selected in Device Selection – Worklist tab, Define Query section

⁶ From Patient Search tab in Patient Data Entry – "Procedure ID" field.

⁷ From Patient Search tab in Patient Data Entry – "Accession #" field

⁸ From Patient Search tab in Patient Data Entry – "Last Name" field

⁹ From Patient Search tab in Patient Data Entry – "Patient ID" field

4.2.3 Hardcopy Application Entity Specification
4.2.3.1 SOP Classes

iE33 provides Standard Conformance to the following SOP Classes:

Table 27
SOP CLASSES FOR AE HARDCOPY

SOP Class Name	SOP Class UID	SCU	SCP
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Yes	No
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Yes	No

4.2.3.2 Association Establishment Policy
4.2.3.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 28
DICOM APPLICATION CONTEXT FOR AE HARDCOPY

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.3.2.2 Number of Associations

iE33 initiates one Association at a time for each configured hardcopy device. Multiple hardcopy devices can be configured.

Table 29
NUMBER OF ASSOCIATIONS INITIATED FOR AE HARDCOPY

Maximum number of simultaneous Associations	2 (number of configured hardcopy devices)
---	---

4.2.3.2.3 Asynchronous Nature

iE33 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 30
ASYNCHRONOUS NATURE AS A SCU FOR AE HARDCOPY

Maximum number of outstanding asynchronous transactions	1
---	---

4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 31
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE HARDCOPY

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

4.2.3.3 Association Initiation Policy
 4.2.3.3.1 Activity – Film Images
 4.2.3.3.1.1 Description and Sequencing of Activities

The system composes images onto film sheets and sends print requests to job queue.

Figure 7 illustrates the print sequence.

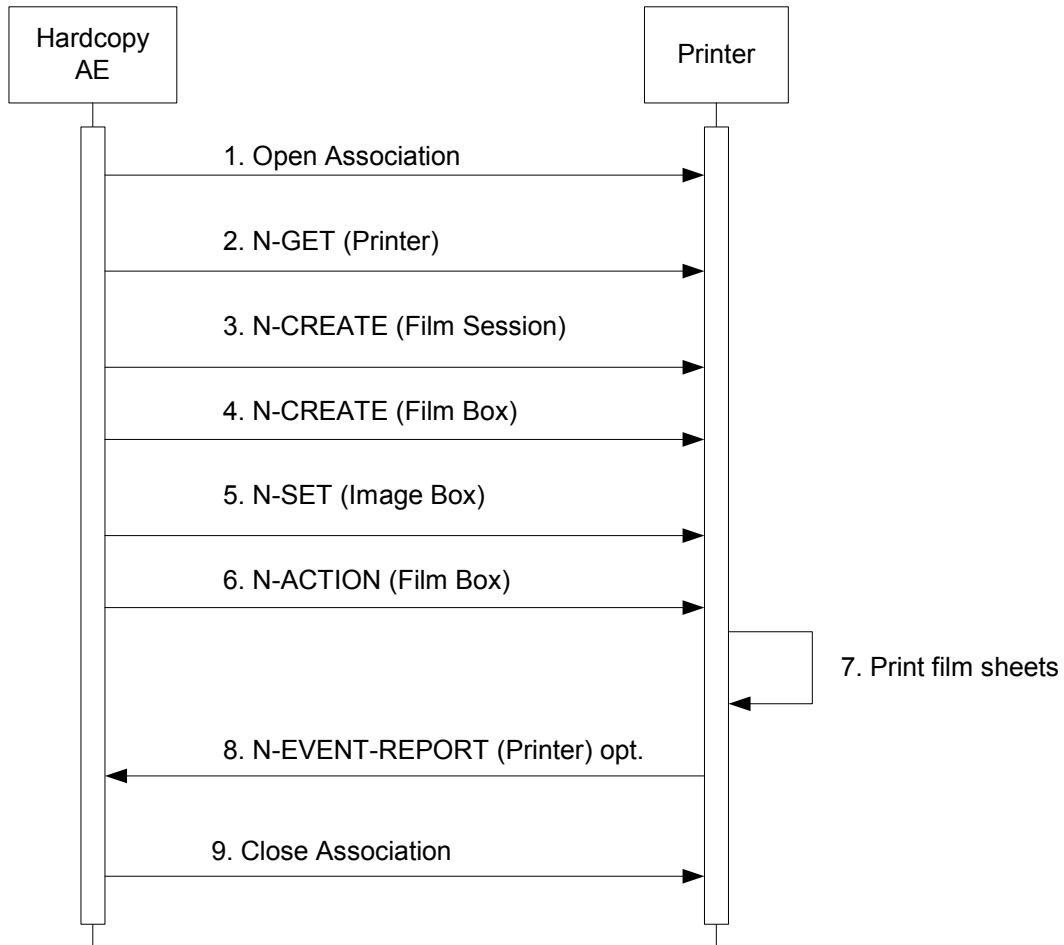


Figure 7
SEQUENCING OF ACTIVITY – FILM IMAGES

Figure 7 illustrates a typical sequence of DIMSE messages sent over an association between Hardcopy AE and a Printer.

Status of the print-job is reported through the print queue interface. Only one job will be active at a time for each separate hardcopy device. If any Response from the remote Application contains a status other than Success or Warning, the Association is aborted and the related Job is switched to a failed state. It can be restarted any time by user interaction.

4.2.3.3.1.2 Proposed Presentation Contexts

Table 32 shows the Presentation Contexts iE33 is capable of proposing.

**Table 32
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY FILM IMAGES**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
Basic Color Print Management Meta	1.2.840.10008.5.1.1.18	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

4.2.3.3.1.3 Common SOP Specific Conformance for all Print SOP Classes

Table 33 summarizes the general behavior of Hardcopy AE during communication failure. This behavior is common for all SOP Classes supported by Hardcopy AE.

**Table 33
HARDCOPY COMMUNICATION FAILURE BEHAVIOR**

Exception	Behavior
Timeout	The Association is aborted and reported as "Failed."
Association aborted by the SCP or network layers	"Network Communication Failure" is reported.

4.2.3.3.1.4 SOP Specific Conformance for the Printer SOP Class

Hardcopy AE supports the following DIMSE operations and notifications for the Printer SOP Class:

- N-GET

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.4.1 Printer SOP Class Operations (N-GET)

Hardcopy AE uses the Printer SOP Class N-GET operation to obtain information about the current printer status. Table 34 lists the attributes obtained via N-GET.

**Table 34
PRINTER SOP CLASS N-GET RESPONSE ATTRIBUTES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Printer Status	(2110,0010)	CS	Provided by Printer	ALWAYS	PRINTER
Printer Status Info	(2110,0020)	CS	Provided by Printer	ALWAYS	PRINTER

The Printer Status information is evaluated as follows:

1. If Printer status (2110,0010) is NORMAL, the print-job continues to be printed.
2. If Printer status (2110,0010) is FAILURE, the print-job is marked as failed.

3. If Printer status (2110,0010) is WARNING, the print-job continues to be printed.

Table 35 summarizes the behavior of Hardcopy AE when encountering status codes in a N-GET response.

**Table 35
PRINTER SOP CLASS N-GET RESPONSE STATUS HANDLING BEHAVIOR**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The request to get printer status information was success.
*	*	Any other status code.	Same as Timeout above.

4.2.3.3.1.4.2 Printer SOP Class Notifications (N-EVENT-REPORT)

Hardcopy AE is capable of receiving an N-EVENT-REPORT request at any time during an association.

Table 36 summarizes the behavior of Hardcopy AE when receiving Event Types within the N-EVENT-REPORT.

**Table 36
PRINTER SOP CLASS N-EVENT-REPORT BEHAVIOUR**

Event Type Name	Event Type ID	Behavior
Normal	1	The print-job continues to be printed.
Warning	2	The print-job. For user-recoverable warnings, the job fails and a 1-hour retry period starts, retrying every 20 seconds.
Failure	3	The print-job is marked as failed.
*	*	Status code of 0113H

Table 37 summarizes the reasons for returning specific status codes in a N-EVENT-REPORT response.

**Table 37
PRINTER SOP CLASS N-EVENT-REPORT RESPONSE STATUS REASONS**

Service Status	Further Meaning	Error Code	Reasons
Success	Success	0000	The notification event has been successfully received.
Failure	No Such Event Type	0113H	An invalid Event Type ID was supplied in the N-EVENT-REPORT request.
Failure	Processing Failure	0110H	An internal error occurred during processing of the N-EVENT-REPORT. A short description of the error will be returned in Error Comment (0000,0902).

4.2.3.3.1.5 SOP Specific Conformance for the Film Session SOP Class

Hardcopy AE supports the following DIMSE operations for the Film Session SOP Class:

— N-CREATE

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.5.1 Film Session SOP Class Operations (N-CREATE)

Table 38 lists the attributes supplied in an N-CREATE Request.

Table 38
FILM SESSION SOP CLASS N-CREATE REQUEST ATTRIBUTES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Copies	(2000,0010)	IS	Default 1. User defined in Device Configuration.	ALWAYS	USER
Medium Type	(2000,0030)	CS	BLUE FILM, CLEAR FILM or PAPER*	ALWAYS	USER
Film Destination	(2000,0040)	CS	MAGAZINE or PROCESSOR*	ALWAYS	USER

* Dependent on the specific printer selected

Table 39 summarizes the behavior of Hardcopy AE when encountering status codes in a N-CREATE response.

Table 39
FILM SESSION SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Attribute Value Out of Range	0116H	System continues operations.
Warning	Attribute List Error	0107H	Same as above.
*	*	Any other status code.	The Association is aborted and the print-job fails.

4.2.3.3.1.7 SOP Specific Conformance for the Film Box SOP Class

Hardcopy AE supports the following DIMSE operations for the Film Box SOP Class:

- N-CREATE
- N-ACTION

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.7.1 Film Box SOP Class Operations (N-CREATE)

Table 40 lists the attributes supplied in an N-CREATE Request.

Table 40
FILM BOX SOP CLASS N-CREATE REQUEST ATTRIBUTES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Display Format	(2010,0010)	ST	STANDARD\1,1 or CUSTOM\xxx depending on printer. Default is displayed, and is user editable. Use only when substitute value is known.	ALWAYS	AUTO/USER
Referenced Film Session Sequence	(2010,0500)	SQ		ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.5.1.1.1	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)	UI	From created Film Session SOP Instance	ALWAYS	AUTO

Film Orientation	(2010,0040)	CS	PORTRAIT or LANDSCAPE	ALWAYS	USER
Film Size ID	(2010,0050)	CS	Depends on configuration file selected. DICOM Defined Terms plus US_Letter.	ALWAYS	USER
Magnification Type	(2010,0060)	CS	Default Value = NONE	ALWAYS	AUTO
Border Density	(2010,0100)	CS	BLACK	ALWAYS	AUTO
Empty Image Density	(2010,0110)	CS	BLACK	ALWAYS	AUTO
Min Density	(2010,0120)	US	Default value displayed, user editable	ALWAYS	AUTO/USER
Max Density	(2010,0130)	US	Default value displayed, user editable	ALWAYS	AUTO/USER
Configuration Information	(2010,0150)	ST	Default value displayed, user editable	ALWAYS	AUTO/USER

Table 41 summarizes the behavior of Hardcopy AE when encountering status codes in a N-CREATE response.

**Table 41
FILM BOX SOP CLASS N-CREATE RESPONSE STATUS HANDLING BEHAVIOR**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Warning	Requested Max Density outside of printer's operating range	B605H	The N-CREATE operation is considered successful but the status meaning is logged.
*	*	Any other status code.	The Association is aborted and the job failed.

4.2.3.3.1.7.2 Film Box SOP Class Operations (N-ACTION)

The Hardcopy AE issues an N-ACTION Request to instruct the Print SCP to print the contents of the Film Box.

Table 42 summarizes the behavior of Hardcopy AE when encountering status codes in an N-ACTION response.

**Table 42
FILM BOX SOP CLASS N-ACTION RESPONSE STATUS HANDLING BEHAVIOR**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully. The film has been accepted for printing.
Warning	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)	B603H	The Association is aborted and the job is failed.
Failure	Unable to create Print Job SOP Instance; print queue is full.	C602	Same as B603H above.
*	*	Any other status code.	Same as B603H above.

4.2.3.3.1.8 SOP Specific Conformance for the Image Box SOP Class

Hardcopy AE supports the following DIMSE operations for the Image Box SOP Class:

— N-SET

Details of the supported attributes and status handling behavior are described in the following subsections.

4.2.3.3.1.8.1 Image Box SOP Class Operations (N-SET)

Table 43 lists the attributes supplied in an N-SET Request.

**Table 43
IMAGE BOX SOP CLASS N-SET REQUEST ATTRIBUTES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Position	(2020,0010)	US	1	ALWAYS	AUTO
Polarity	(0020,0020)	CS	NORMAL	ALWAYS	AUTO
Basic Grayscale Image Sequence	(2020,0110)	SQ	Used for BW (Monochrome2) print	ALWAYS*	AUTO
Basic Color Image Sequence	(2020,0111)	SQ	Used for Color (RGB) print	ALWAYS*	AUTO
>Samples Per Pixel	(0028,0002)	US	1 for Monochrome2, 3 for Color	ALWAYS	AUTO
>Photometric Interpretation	(0028,0004)	CS	MONOCHROME2 or RGB	ALWAYS	AUTO
Planar Configuration	(0028,0006)		Always "01" for Color by Plane, only used in Color print.	ANAP	AUTO
>Rows	(0028,0010)	US	Depends on film size, number of rows for entire sheet of film	ALWAYS	Printer Configuration File
>Columns	(0028,0011)	US	Depends on film size, number of columns for entire sheet of film	ALWAYS	Printer Configuration File
>Bits Allocated	(0028,0100)	US	8	ALWAYS	AUTO
>Bits Stored	(0028,0101)	US	8	ALWAYS	AUTO
>High Bit	(0028,0102)	US	7	ALWAYS	AUTO
>Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO
>Pixel Data	(7FE0,0010)	OB/OW	Pixels of rendered film sheet. OB – BW, OW – RGB	ALWAYS	AUTO

* Mutually exclusive attributes

Table 44 summarizes the behavior of Hardcopy AE when encountering status codes in a N-SET response.

**Table 44
IMAGE BOX SOP CLASS N-SET RESPONSE STATUS HANDLING BEHAVIOR**

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The SCP has completed the operation successfully.
Failure	Insufficient memory in printer to store the image.	C605	The Association is aborted and the job is failed.

*	*	Any other status code.	Same as C605 above.
---	---	------------------------	---------------------

4.2.3.4 Association Acceptance Policy

The Hardcopy Application Entity does not accept Associations.

4.2.4 Verification Application Entity specification

4.2.4.1 SOP Class

iE33 provides Standard Conformance to the following SOP Class:

**Table 45
SOP CLASSES FOR AE VERIFICATION**

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	Yes

4.2.4.2 Association Establishment Policy

4.2.4.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

**Table 46
DICOM APPLICATION CONTEXT FOR AE VERIFICATION**

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

4.2.4.2.2 Number of Associations

iE33 initiates one Association at a time for a Verification request.

**Table 47a
NUMBER OF ASSOCIATIONS INITIATED FOR AE VERIFICATION**

Maximum number of simultaneous Associations	Up to 8, one for each configured remote device
---	--

**Table 47b
NUMBER OF ASSOCIATIONS ACCEPTED FOR AE VERIFICATION**

Maximum number of simultaneous Associations	Unlimited, however, calling AE must be already configured in iE33.
---	--

4.2.4.2.3 Asynchronous Nature

iE33 does not support asynchronous communication (multiple outstanding transactions over a single Association).

**Table 48
ASYNCHRONOUS NATURE AS A SCU FOR AE VERIFICATION**

Maximum number of outstanding asynchronous transactions	1
---	---

4.2.4.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

**Table 49
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE VERIFICATION**

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

4.2.4.3 Association Initiation Policy

4.2.4.3.1 Activity – Verify as SCU and SCP

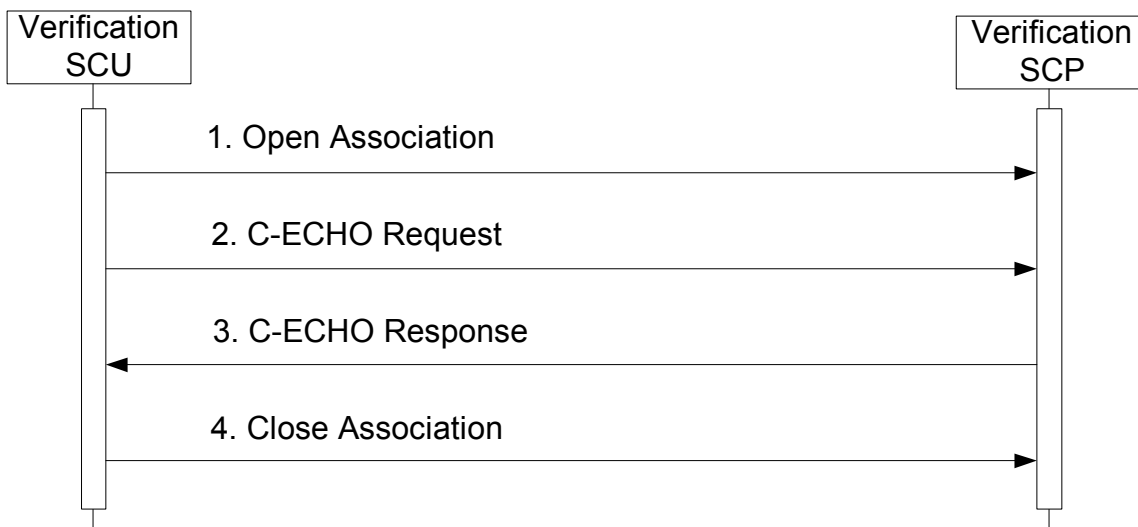
4.2.4.3.2 Description and Sequencing of Activities

SCU: The user selecting the “Verify” button on the Device configuration page initiates the verification request to the device whose data has just been configured. This tool allows the user to ensure all data was correctly entered and the remote device may be contacted. It uses C-Echo and verifies the remote device supports all configured SOP Classes. Any SOP Classes requested that are not supported will report, “failed”. Operations may continue, but objects of the type that are not supported will not be exported. See note in 4.2.4.3.5.1 Verification SOP Class Notifications.

SCP: The system listens on the port configured on the Global System Configuration screen for Verification requests initiated by other remote devices. The calling device AE must already be configured as a remote device in order for iE33 to respond.

iE33 initiates an Association in order to issue:

- C-ECHO request according to the Verification SOP Class.



**Figure 8a
SEQUENCING OF ACTIVITY – ISSUE VERIFY**

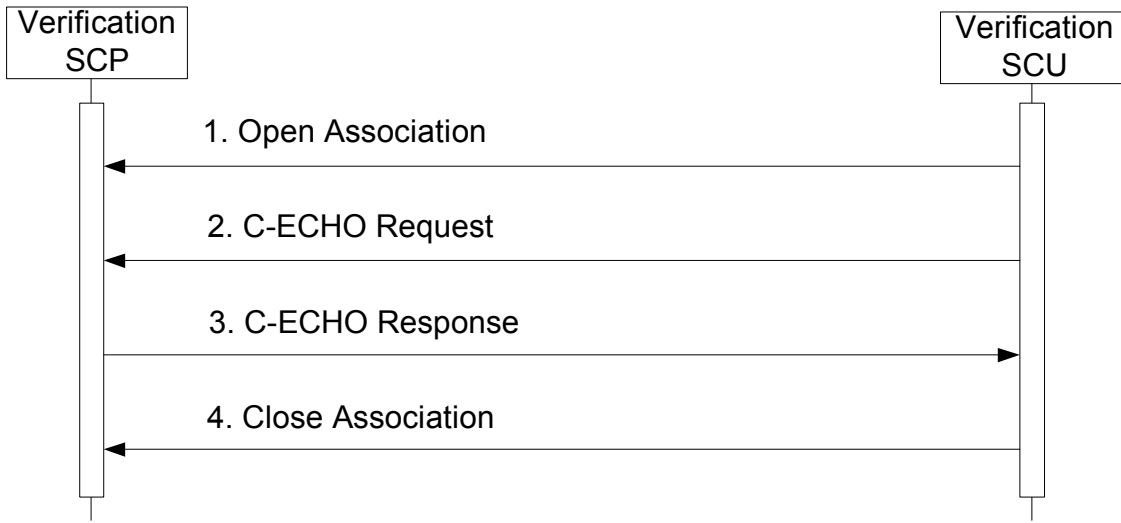


Figure 8b
SEQUENCING OF ACTIVITY – RECEIVE VERIFY

4.2.4.3.3 Proposed Presentation Contexts

iE33 will propose Presentation Contexts as shown in the following table:

Table 50
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY VERIFICATION

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU /SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		

4.2.4.3.4 SOP Specific Conformance for Verification

Table 51 summarizes the behavior of iE33 when encountering status codes in a Verification C-ECHO response.

A message will appear on the user interface if iE33 receives any other SCP response status than “Success.”

Table 51
VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	xxxxxxx	0000	Device Status is set to: Verified
Refused	Out of Resources	A700	Device Status is set to: Not Verified
Failed	Unable to Process	C000 – CFFF	Same as “Refused” above.
*	*	Any other status code.	Same as “Refused” above.

4.2.4.3.5 Association Acceptance Policy
4.2.4.3.5.1 Verification SOP Class Notifications

Possible Responses:

Device Verification Succeeded	Device Verification Failed
{SOP Class(es)}: Verified	{SOP Class(es)}: Not Verified
Verification: Verified	

Note: A given “Archive” server may not support all of the SOP Classes requested in the Verification request. Receiving failures (“Not Verified”) responses for SOP Classes outside the scope or capability of the server will not result in a communications failure. For example, if the correct Image Store SOP Classes are supported and Structured Report is not, then Image Storage will work successfully, and SRs will not be sent to the server. If multiframe is not supported and loops are acquired, the transfer will fail. In this case however, the single frame images will transfer.

Compressed Multiframe SOP Class is only negotiated for the actual image transfer.

4.3 PHYSICAL NETWORK INTERFACES

4.3.1 Supported Communication Stacks

4.3.1.1 TCP/IP Stack

All iE33 DICOM applications provide DICOM TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.3.2 Physical Network Interface

iE33 supports a single network interface. The following physical network interface is available:

Table 52
SUPPORTED PHYSICAL NETWORK INTERFACES

Ethernet 10/100BaseT, RJ-45, UTP, STP; AutoDetect Duplex, Full or Half Duplex

4.4 CONFIGURATION

4.4.1 AE Title/Presentation Address Mapping

The Devices Configuration section allows the following device types to be configured:

Device Type	Supported SOPs
DICOM Archive Server	Ultrasound Store Ultrasound Multiframe Store Comprehensive Structured Report Store* Storage Commitment Push Model**
DICOM Commit Server	Storage Commitment Push Model**
DICOM Worklist Server	Modality Work List
DICOM Structured Report Server	Comprehensive Structured Report Store*
DICOM BW Printer	Basic Grayscale Print Meta
DICOM Color Printer	Basic Color Print Meta

* See section 4.4.1.2.1 below.

** Storage Commitment must only be configured if supported by the Archive Server or a stand-alone server. In either case, the “Commit Server” and “Target Archive Server” must ONLY be configured if commitment is used.

To configure a single server that supports image store and commitment, then a separate Device must be configured using the appropriate AE Title, IP Address and Port data.

4.4.1.1 Local AE Title

All local AEs use the AE Title and TCP/IP Port configured via the Global Configuration Screen. All local AEs use the same AE Title. The system listens for Verification requests and Storage Commitment reports on the configured Port. All devices also support Verification as an SCU, allowing the use of the Verify button.

4.4.1.2 Remote AE Title/Presentation Address Mapping

The AE Titles, IP Addresses and Port numbers of remote applications are configured using the Devices Configuration Screen.

The "Device Name" field is used only as an 'alias' to contain the user/site specified name for the device that will be presented to the user for selection in the system configuration user interface. The contents of this field are not used in DICOM communications.

4.4.1.2.1 Storage

The New Device button on the Global Devices Setup screen opens the Add Device dialog that allows configuration of the AE Titles, Port numbers, and IP Addresses for the remote Storage SCPs. Multiple remote Storage SCPs can be defined.

- Structured Reports will be sent to an Archive device if SR support is confirmed using Verify. If the Archive does not support SR, configure the DICOM Structured Report Server. If SR support is confirmed using verify and measurements are made during the exam, a Structured Report will be sent to the archive.

Custom or User Defined measurements will not be sent in an SR. If no separate SR server is configured and the SOP Class fails negotiation on the Archive, then no SR objects will be created.

4.4.1.2.2 Workflow

Setup is used to set the AE Title, Port number and IP Address the remote MWL SCP. Multiple MWL SCPs may be defined, but only a single remote MWL SCP can be selected at a time.

All MWL queries use Modality = US. This cannot be changed.

Automated queries may be set for a specific time interval, Startup and every 15, 30, 45, 60, 75, 90, 105 or 120 minutes, or at End of Exam. Automated queries use the current data and Modality = US. They may additionally use "Station Name", "System Location" and "AE Title" to further refine the search.

4.4.1.2.3 Hardcopy

Setup is used to set the AE Titles, Port numbers and IP Addresses for the remote Print SCPs.

Multiple remote Print SCPs can be defined, but up to one Grayscale and one Color Print SCP may be selected at a time.

5 MEDIA STORAGE

5.1 IMPLEMENTATION MODEL

5.1.1 Application Data Flow

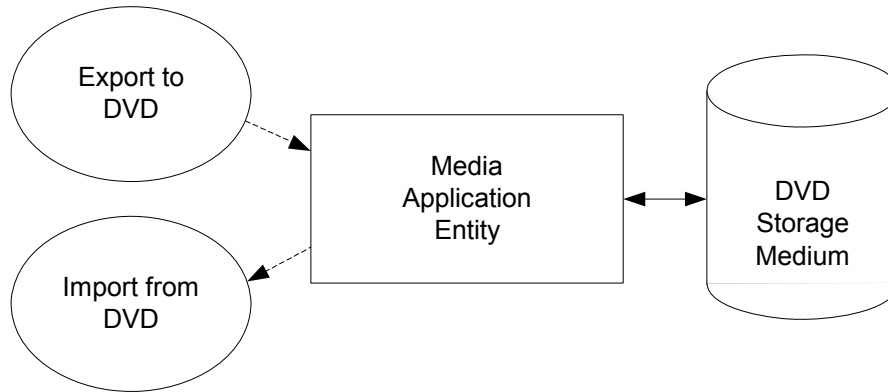


Figure 9
APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

- Throughout this section, the term “DVD” refers to any of the media listed below which is in use.
- The Media Application Entity exports images and Presentation States to a DVD Storage medium. It is associated with the local real-world activity “Export to DVD”. “Export to DVD” is performed upon user request for selected patients, studies, series or instances (images or structured reports).
- iE33 will support the use of most writable media including CD-R, DVD-R, DVD+R, DVD-RW and DVD+RW. DVD+RW is recommended. DICOM directory structure will be the same regardless of media used. CD-R media will be initially formatted UDF, but **MUST** be ‘closed’ and converted to ISO-9660 format using “**Soft Eject**”, the eject button on the Review Directory screen. The user **must not** use eject button on the DVD drive to eject media, only to insert. After using CD-R media, it may be returned to the system for further use if the media supports multi-session.

Note that although –R or +R media may be “formatted”, the media cannot be erased. If a –R or +R media is formatted, the previously written data is no longer available, and only the remaining unwritten space on the media is available after format. This restriction does not apply to +RW media. Formatting +RW media allows the entire disk space to be used.

5.1.2 Functional Definition of AEs

5.1.2.1 Functional Definition of Media Application Entity

Activation of the “Export to DVD” icon or menu entry will pass the currently selected patients exams or individually selected images to the Media Application Entity. The SOP Instances associated with the selection will be collected into one or more export jobs. The contents of each export job will be written to a single DVD media.

5.1.3 Sequencing of Real-World Activities

At least one image must exist and be selected before the Media Application Entity can be invoked. The operator can insert a new DVD media at any time. The Media Application Entity will wait indefinitely for a media to be inserted before starting to write to the DVD device. If no DVD media is available, the DVD queue management Icon will be Yellow.

5.1.4 File Meta Information Options

The implementation information written to the File Meta Header in each file is:

**Table 65
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE**

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

5.2 AE SPECIFICATIONS

5.2.1 Media Application Entity Specification

The Media Application Entity provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in

**Table 66
APPLICATION PROFILES, ACTIVITIES AND ROLES FOR OFFLINE-MEDIA**

Application Profiles Supported	Real World Activity	Role	SC Option
STD-US-SC-SF-DVD	Export to DVD	FSC, R*, U	Interchange
STD-US-SC-MF-DVD			

* File Set Reader functionality is limited only to media created by other iE33 or iU22 systems.

5.2.1.1 File Meta Information for the Application Entity

The File-Set Identifier included in the File Meta Header is "PHILIPS MIP".

5.2.1.2 Real-World Activities

5.2.1.2.1 Activity – Export to DVD

The Media Application Entity acts as an FSC using the interchange option when requested to export SOP Instances from the local database to a DVD medium.

The contents of the export job will be written together with a corresponding DICOMDIR to a single-session DVD. Writing in multi-session mode is not supported. The user can cancel an export job in the job queue.

5.2.1.2.2 Activity – Read from DVD

The Media Application Entity acts as an FSR using the interchange option when requested to import SOP Instances from a DVD medium to the local database. Only media and images written by iE33 or iU22 systems may be read.

The Patient directory UI presents the directory of the system or the offline media. Selected exams are transferred from the media to the system for review. Objects transferred to the system retain their original SOP Instance UIDs.

Note: No native data, 3D objects, 3D Subpages or Structured Reports may be read back into the iE33.

5.2.1.2.3 Activity – Update to DVD

The Media Application Entity acts as an FSU using the interchange option when requested to export SOP Instances from the local database to a DVD medium.

The system user selects exams from the system's directory for transfer to a DVD that already contains data. The DICOMDIR is updated allowing access to original and new data.

DVD media may be formatted at any time, removing all previously recorded data.

5.2.1.2.3.1 Media Storage Application Profiles

The Media Application Entity supports the STD-US-SC-SF-DVD and STD-US-SC-MF-DVD Application Profiles.

5.2.1.2.3.2 Options

The Media Application Entity supports the SOP Classes and Transfer Syntaxes listed in Table 67.

Table 67

IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR OFFLINEMEDIA

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Baseline Lossy Compression	1.2.840.10008.1.2.4.50
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian	1.2.840.10008.1.2.1
Private 3D Presentation State*	1.3.46.670589.2.5.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1

* For import to QLAB or Xcelera workstations only.

Media Export – Import Support Table

Export	Import
Single Frame Images	Single Frame Images
Multiframe Images	Multiframe Images
Structured Reports	
Native Data*	
3D Volume Data*	
3D Subpage Data*	

* Intended for use on QLAB and Xcelera workstations only

6 SUPPORT OF CHARACTER SETS

All iE33 DICOM applications support the

ISO_IR 100 (ISO 8859-1:1987 Latin Alphabet No. 1 supplementary set)

7 SECURITY

DICOM security is not implemented on the iE33 at this time.

iE33 incorporates an internal firewall that only accepts incoming traffic on the designated listening port, as configured in the System tab of the Global Configuration screen.

8 ANNEXES

8.1 CREATED IOD INSTANCES

Table 69 specifies the attributes of an Ultrasound Image transmitted by the iE33 storage application.

Table 70 specifies the attributes of a Comprehensive Structured Reports transmitted by the iE33 storage application.

The following tables use a number of abbreviations. The abbreviations used in the “Presence of ...” column are:

- VNAP Value Not Always Present (attribute sent zero length if no value is present)
- ANAP Attribute Not Always Present
- ALWAYS Always Present
- EMPTY Attribute is sent without a value

The abbreviations used in the “Source” column:

- MWL the attribute value source Modality Worklist
- USER the attribute value source is from User input
- AUTO the attribute value is generated automatically
- CONFIG the attribute value source is a configurable parameter

NOTE: All dates and times are encoded in the local configured calendar and time. Date, Time and Time zone are configured using the Service/Installation Tool.

8.1.1 US or US Multiframe Image IOD

Table 69
IOD OF CREATED US OR US MULTIFRAME SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 71	ALWAYS
Study	General Study	Table 72	ALWAYS
	Patient Study	Table 73	ALWAYS
Series	General Series	Table 74	ALWAYS
Equipment	General Equipment	Table 75	ALWAYS
Image	General Image	Table 76	ALWAYS
	Image Pixel	Table 77	ALWAYS
	Cine	Table 78	Only if Multi-frame
	Multi-frame	Table 79	Only if Multi-frame
	US Region Calibration	Table 80	ANAP
	US Image	Table 81	ALWAYS
	VOI LUT	Table 82	ALWAYS
	SOP Common	Table 83	ALWAYS

8.1.2 Comprehensive Structured Report IOD

Table 70
IOD OF CREATED COMPREHENSIVE STRUCTURED REPORT SOP INSTANCES

IE	Module	Reference	Presence of Module
Patient	Patient	Table 71	ALWAYS
Study	General Study	Table 72	ALWAYS
	Patient Study	Table 73	ALWAYS
Series	SR Document Series	Table 84	ALWAYS
Equipment	General Equipment	Table 75	ALWAYS
Document	SR Document General	Table 85	ALWAYS
	SR Document Content	Table 86	ALWAYS
	SOP Common	Table 87	ALWAYS

8.1.3 Common Modules

Table 71
PATIENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Same attribute of MWL or PDE input	ALWAYS	MWL/ USER
Patient ID	(0010,0020)	LO	From MWL, user input or system generated. Maximum 64 characters.	ALWAYS	MWL/ USER/ AUTO
Patient's Birth Date	(0010,0030)	DA	Same attribute of MWL or PDE input	VNAP	MWL/ USER
Patient's Sex	(0010,0040)	CS	Same attribute of MWL or PDE input	VNAP	MWL/ USER
Other Patient Ids	(0010,1000)	LO	Same attribute of MWL	VNAP	MWL
Ethnic Group	(0010,2160)	SH	Same attribute of MWL	VNAP	MWL
Patient Comments	(0010,4000)	LT	Same attribute of MWL or PDE input	VNAP	MWL/ USER

Table 72
GENERAL STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Same value as in MWL or auto generated	ALWAYS	MWL/ AUTO
Study Date	(0008,0020)	DA	Study's Start Date (0040,0244).	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Study's Start Time (0040,0245).	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN	Same value as in MWL or PDE input.	VNAP	MWL/ USER
Study ID	(0020,0010)	SH	MWL Requested Procedure ID (0040,1001) or auto-generated	ALWAYS	MWL/ AUTO

Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/ USER
Study Description	(0008,1030)	LO	MWL Scheduled Procedure Step Description (0040,0007) or PDE input	VNAP	MWL/ USER
Physician(s) of Record	(0008,1048)	PN	Same attribute as MWL	ANAP	MWL
Referenced Study Sequence	(0008,1110)	SQ	One item per item in the MWL Reference Study Sequence. Absent if unscheduled.	ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI	Same value as in of the Reference Study Sequence in the MWL	VNAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI	Same value as in of the Reference Study Sequence in the MWL	VNAP	MWL
>Requested Procedure Description	(0032,1060)	LO	Same value as in of the Reference Study Sequence in the MWL	VNAP	MWL
Procedure Code Sequence	(0008,1032)	SQ	MWL Requested Procedure Code Sequence (0032,1064)	ANAP	MWL
>Code Value	(0008,0100)	SH	Same value as MWL attribute	VNAP	MWL
>Coding Scheme Designator	(0008,0102)	SH	Same value as MWL attribute	VNAP	MWL
>Coding Scheme Version	(0008,0103)	SH	Same value as MWL attribute	VNAP	MWL
>Code Meaning	(0008,0104)	LO	Same value as MWL attribute	VNAP	MWL

**Table 73
PATIENT STUDY MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnosis Description	(0008,1080)	LO	Same attribute as MWL attribute	VNAP	MWL
Patient Size	(0010,1020)	DS	Same value as MWL attribute or PDE input	VNAP	MWL/ USER
Patient's Weight	(0010,1030)	DS	Same value as MWL attribute or PDE input	VNAP	MWL/ USER
Additional Patient's History	(0010,21B0)	LT	Same value as MWL attribute	VNAP	MWL
Pregnancy Status	(0010,21C0)	US	Same value as MWL attribute	ANAP	MWL

**Table 74
GENERAL SERIES MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"US"	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Auto-generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	A number unique within the Study.	ALWAYS	AUTO
Series Date	(0008,0021)	DA	Date of first image in series.	ALWAYS	AUTO
Series Time	(0008,0031)	TM	Time of first image in series.	ALWAYS	AUTO

Performing Physician's Name	(0008,1050)	PN	MWL Scheduled Performing Physician's Name (0040,0006)	VNAP	MWL
Protocol Name	(0018,1030)	LO	"Free Form" "Exercise 2 Stage" "Exercise 3 Stage" "Pharmacological 4 Stage" "Wall Contrast" "Quantitative 4 Stage"	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Same as Study Description.	ANAP	USER
Operator's Name	(0008,1070)	PN	From PDE "Sonographer" field	VNAP	USER
Request Attributes Sequence	(0040,0275)	SQ	Present if scheduled from MWL. One item.	VNAP	AUTO
>Requested Procedure ID	(0040,1001)	SH	Same value as MWL attribute.	ALWAYS	MWL
>Scheduled Procedure Step ID	(0040,0009)	SH	Same value as MWL attribute.	ALWAYS	MWL
>Scheduled Procedure Step Description	(0040,0007)	LO	Same value as MWL attribute.	VNAP	MWL
>Scheduled Protocol Code Sequence	(0040,0008)	SQ	Same value as MWL attribute.	VNAP	MWL

**Table 75
GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	Philips Medical Systems	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	Setups configuration	VNAP	CONFIG
Station Name	(0008,1010)	SH	Setups configuration	VNAP	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	iE33	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO	Automatically set	ALWAYS	AUTO
Software Version	(0018,1020)	LO	PMS1.1 Ultrasound Neo 1.0	ALWAYS	AUTO

8.1.4 US or Multiframe Image Modules

**Table 76
GENERAL IMAGE MODULE OF CREATED US SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Generated by device, increments from "1" in each series	ALWAYS	AUTO
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYS	AUTO
Content Time	(0008,0033)	TM	<hhmmss>	ALWAYS	AUTO
Image Type	(0008,0008)	CS	ORIGINAL/PRIMARY for uncompressed, DERIVED/PRIMARY if compressed	ALWAYS	CONFIG

Derivation Description	(0008,2111)	ST	“Uncompressed”, “Low”, “Medium”, “High” based on configuration setting	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	Set to “YES”	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	Present “01” if image is lossy compressed, “00” if not.	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	“IDENTITY“ Only if “Image Export Format” is GSDF. Else, not sent.	ANAP	AUTO

**Table 77
IMAGE PIXEL MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	See US Image Module Table 81	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	See US Image Module Table 81	ALWAYS	AUTO
Rows	(0028,0010)	US	Image height in pixels: 240*, 480**, 768***, 1024****	ALWAYS	CONFIG
Columns	(0028,0011)	US	Image width in pixels: 320*, 640**, 1024***, or 1280****	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Number of info bits in pixel: “8”	ALWAYS	AUTO
High Bit	(0028,0102)	US	High bit is 7	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	“0” pixels are Unsigned integers	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OW / OB		ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Value is always “0”.	ALWAYS	AUTO

Image Size details: * = ROI Multiframe images, ** = Multiframe images, *** = Single Frame Display Area only images and **** = Single Frame Full Screen images (no scaling data).

**Table 78
CINE MODULE OF CREATED US MULTIFRAME SOP**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Time	(0018,1063)	DS	Frame time in milliseconds	ANAP	AUTO

**Table 79
MULTI-FRAME MODULE OF CREATED US MULTIFRAME SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames	(0028,0008)	IS	# of frames in object	ANAP	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063) Frame Time only	ANAP	AUTO

Table 80
US REGION CALIBRATION MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES
 Not sent in Full Screen Single Frame images.

Attribute Name	Tag	VR	Value	Presence of Value	Source
Sequence of Ultrasound Regions	(0018,6011)	SQ	A sequence is present for each region on the system display, except for ECG regions. Only when set for "Display Area". No scaling for "Full Screen" images.	ANAP	AUTO
>Region Location Min x ₀	(0018,6018)	UL	Top Left position of region.	ALWAYS	AUTO
>Region Location Min y ₀	(0018,601A)	UL	Top Left position of region	ALWAYS	AUTO
>Region Location Max x ₁	(0018,601C)	UL	Bottom Right position of region	ALWAYS	AUTO
>Region Location Max y ₁	(0018,601E)	UL	Bottom Right position of region	ALWAYS	AUTO
>Physical Units X Direction	(0018,6024)	US	Enumerated Value. 2D Image = 0003H = CM Mmode / Doppler = 0004H = SEC	ALWAYS	AUTO
>Physical Units Y Direction	(0018,6026)	US	Enumerated Value. 2D Image = 0003H = CM Mmode = 0003H = CM Doppler = 0007H = CM / SEC	ALWAYS	AUTO
>Physical Delta X	(0018,602C)	FD	The physical value per pixel increment	ALWAYS	AUTO
>Physical Delta Y	(0018,602E)	FD	The physical value per pixel increment	ALWAYS	AUTO
>Reference Pixel X ₀	(0018,6020)	SL	The X pixel value of baseline	ANAP	AUTO
>Reference Pixel Y ₀	(0018,6022)	SL	The Y pixel value of baseline	ANAP	AUTO
>Region Spatial Format	(0018,6012)	US	A bit mask 0-5 if: none, 2d, Mmode, spectral Doppler. See DICOM PS3.3 C.8.5.5.1.1	ALWAYS	AUTO
>Region Data Type	(0018,6014)	US	Enumerated Value. See DICOM PS3.3 C.8.5.5.1.2	ALWAYS	AUTO
>Region Flags	(0018,6016)	UL	Bit mask. See DICOM PS3.3 C.8.5.5.1.3	ALWAYS	AUTO

Table 81
US IMAGE MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples Per Pixel	(0028,0002)	US	"3"	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	Uncompressed: "RGB" Compressed: "YBR_FULL_422"	ALWAYS	CONFIG

Bits Allocated	(0028,0100)	US	8 Bits per pixel.	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Number of info bits in pixel: "8"	ALWAYS	AUTO
High Bit	(0028,0102)	US	High bit is 7	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	Value is always "0".	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	"0" Pixels are Unsigned integers	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1063) "Frame Time" only.	ANAP	AUTO
Image Type	(0008,0008)	CS	ORIGINAL/PRIMARY for uncompressed, DERIVED/PRIMARY if compressed	ALWAYS	CONFIG
Lossy Image Compression	(0028,2110)	CS	"01" if image is lossy compressed, "00" if not.	ALWAYS	AUTO
Number of Stages	(0008,2124)	IS	2-n	ANAP	AUTO
Number of Views in Stage	(0008,212A)	IS	1-n	ANAP	AUTO
Stage Name	(0008,2120)	SH	REST, PEAK, POST, IMPOST, BASE, LOW, user defined	ANAP	AUTO
Stage Number	(0008,2122)	IS	1-n	ANAP	AUTO
View Name	(0008,2127)	SH	LAX, SAX, AP4, AP2, AP3, user defined	ANAP	AUTO
View Number	(0008,2128)	IS	1-n	ANAP	AUTO
Number of Event Timers	(0008,2129)	IS	1-n	ANAP	AUTO
Event Elapsed Time(s)	(0008,2130)	DS	nnn sec.	ANAP	AUTO
Event Timer Name(s)	(0008,2132)	LO	1-n	ANAP	AUTO
Trigger Time	(0018,1060)	DS	nnn sec.	ANAP	AUTO
Heart Rate	(0018,1088)	IS	Beats per minute	ANAP	AUTO
Ultrasound Color Data Present	(0028,0014)	US	01	ALWAYS	AUTO
Transducer Data	(0018,5010)	LO	Transducer name.	ALWAYS	AUTO
Processing Function	(0018,5020)	LO	Imaging optimization name.	ALWAYS	AUTO

**Table 82
VOI LUT MODULE OF CREATED US SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Window Center	(0028,1050)	DS	Fixed at 127	ALWAYS	AUTO
Window Width	(0028,1051)	DS	Fixed at 254	ALWAYS	AUTO

**Table 83
SOP COMMON MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES**

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	Attribute only sent if an Extended or Replacement Character Set is used	ANAP	AUTO
Instance Creation Date	(0008,0012)	DA	<yyyymmdd>	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	<hhmmss>	ALWAYS	AUTO
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.6.1 for US or 1.2.840.10008.5.1.4.1.1.3.1 for US Multiframe	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO

8.1.5 Comprehensive Structured Report Modules

Table 84
SR DOCUMENT SERIES MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	SR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Auto-generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	A number unique within the Study	ALWAYS	AUTO
>Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	Identifies the Performed Procedure Step SOP Instance for which this SR is related	ALWAYS	AUTO
>>Referenced SOP Class UID	(0008,1150)	UI	PPS SOP Class = "1.2.840.10008.3.1.2.3.3"	ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)	UI	PPS Instance UID of the PPS generating this document	ALWAYS	AUTO

Table 85
SR DOCUMENT GENERAL MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Unique number	ALWAYS	AUTO
Completion Flag	(0040,A491)	CS	PARTIAL	ALWAYS	AUTO
Verification Flag	(0040,A493)	CS	UNVERIFIED	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date content created.	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time content created.	ALWAYS	AUTO
Referenced Request Sequence	(0040,A370)	SQ	Identifies Requested Procedures being fulfilled by creation of this Document.	Not Used*	MWL
>Study Instance UID	(0020,000D)	UI	Same value as in MWL or auto generated	ALWAYS	MWL/ AUTO
>Referenced Study Sequence	(0008,1110)	SQ	1 item per item in MWL, absent if unscheduled	ANAP	MWL

>>Referenced SOP Class UID	(0008,1150)	UI	Identifies the Referenced SOP Class	ANAP	MWL
>>Referenced SOP Instance UID	(0008,1155)	UI	Instance UID	ANAP	MWL
>Accession Number	(0008,0050)	SH	Same attribute of MWL or user PDE input.	VNAP	MWL/ USER
>Requested Procedure ID	(0040,1001)	SH	1 item per item in MWL, generated if unscheduled	ALWAYS	MWL/ AUTO
>Requested Procedure Description	(0032,1060)	LO	1 item per item in MWL, absent if unscheduled	ANAP	MWL
>Requested Procedure Code Sequence	(0032,1064)	SQ	1 item per item in MWL, absent if unscheduled	ANAP	MWL
Performed Procedure Code Sequence	(0040,A372)	SQ	Codes for the performed procedure. May be zero or more items.	Not Used*	AUTO

* Not present in current release.

Table 86
SR DOCUMENT CONTENT MODULE OF CREATED COMPREHENSIVE SR SOP INSTANCES

This table describes the template-specific data summarized from the following tables in the DICOM Standard:
Document Content Macro, Document Relationship Macro, Numeric Measurement Macro and Code Macro

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Template Sequence	(0040,A504)	SQ		ALWAYS	AUTO
>Mapping Resource	(0008,0105)	CS	DCMR	ALWAYS	AUTO
>Template Identifier	(0040,DB00)	CS	The Root Content Item identifies TID 5200 (Echo) or 5100 (Vascular).	ALWAYS	AUTO
Content Sequence	(0040,A730)	SQ		ALWAYS	AUTO
>Relationship Type	(0040,A010)	CS	For details see Appendix A for Echo or Appendix B for Vascular .	ALWAYS	AUTO
<i>Document Relationship Macro</i>			For details see Appendix A for Echo or Appendix B for Vascular .	ALWAYS	AUTO
<i>Document Content Macro</i>			For details see Appendix A for Echo or Appendix B for Vascular .	ALWAYS	AUTO
Value Type	(0040,A040)	CS	CONTAINER, always first tag of SR	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ		ALWAYS	AUTO
>Code Value	(0008,0100)		125200 or 125100	ALWAYS	AUTO
>Coding Scheme Designator	(0008,0102)		DCM	ALWAYS	AUTO
>Code Meaning	(0008,0104)		"Adult Echocardiography Procedure Report" or "Vascular Ultrasound Procedure Report"	ALWAYS	AUTO
Continuity of Content	(0040,A050)	CS	SEPARATE	ALWAYS	AUTO
<i>Numeric Measurement Macro</i>			For details see Appendix A for Echo or Appendix B for Vascular .	ALWAYS	AUTO
<i>Code Macro</i>			For details see Appendix A for Echo or Appendix B for Vascular .	ALWAYS	AUTO

Table 87
SOP COMMON MODULE OF CREATED COMPOSITE SR SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Specific Character Set	(0008,0005)	CS	Attribute only sent if an Extended or Replacement Character Set is used	ANAP	AUTO
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.88.33	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Generated by device	ALWAYS	AUTO

8.2 USED FIELDS IN RECEIVED IOD BY APPLICATION

The iE33 storage application does not receive SOP Instances. The usage of attributes received via MWL is described in section 4.2.2.3.1.3 SOP Specific Conformance for Modality Worklist.

8.3 ATTRIBUTE MAPPING

Table 88 summarizes the relationships between attributes received via MWL, and stored in acquired images. The format and conventions used in Table 89 are the same as the corresponding table in IHE Technical Framework, Rev. 5.5 04-07-2003, vol. II: Transactions.

Table 88
ATTRIBUTE MAPPING BETWEEN MODALITY WORKLIST, AND IMAGE

Modality Worklist	Image IOD
Patient's Name	Patient's Name
Patient ID	Patient ID
Patient's Birth Date	Patient's Birth Date
Patient's Sex	Patient's Sex
Patient's Weight	Patient's Weight
Referring Physician's Name	Referring Physician's Name
----	----
Study Instance UID	Study Instance UID
Referenced Study Sequence	Referenced Study Sequence
Accession Number	Accession Number
----	Request Attributes Sequence
Requested Procedure ID	>Requested Procedure ID
Requested Procedure Description	>Requested Procedure Description
Scheduled Procedure Step ID	>Scheduled Procedure Step ID
Scheduled Procedure Step Description	>Scheduled Procedure Step Description
Scheduled Protocol Code Sequence	>Scheduled Protocol Code Sequence
----	Performed Protocol Code Sequence
----	Study ID – Requested Procedure

	ID from MWL, else generated
----	Performed Procedure Step ID
----	Performed Procedure Step Start Date
----	Performed Procedure Step Start Time
----	Performed Procedure Step Description
----	----
Requested Procedure Code Sequence	Procedure Code Sequence
----	Referenced Performed Procedure Step Sequence
----	>Referenced SOP Class UID
----	>Referenced SOP Instance UID
----	Protocol Name

8.4 COERCED/MODIFIED FIELDS

The MWL AE will truncate attribute values received in the response to a MWL Query if the value length is longer than the maximum length permitted by the attribute's VR.

8.5 CONTROLLED TERMINOLOGY

The Workflow AE is capable of supporting arbitrary coding schemes for Procedure and Protocol Codes. The contents of Requested Procedure Code Sequence (0032,1064) and Scheduled Protocol Code Sequence (0040,0008) supplied in Worklist Items will be mapped to Image IOD attributes as described in Table 88.

8.6 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

8.6.1 Standard Extended / Specialized / Private SOPs

The US or US Multiframe Image Storage SOP Classes are extended to create a Standard Extended SOP Class by addition of standard and private attributes to the created SOP Instances as documented in section 8.1.

Private Creator tag ranges

2001,xxxx

200D,xxxx

are used to communicate a variety of data. These private tags are intended for use with Philips workstations and ultrasound systems only.

The next section describes the use of the private SOP Class for 3D Subpages. Appendix C lists the private tags used in 3D Volume data.

Additional private tag data, known as "Native Data" also uses tags within these groups.

The tags that are sent via network or media are depended on settings for the specific destination, as found in "Print/Network>Device Selection and either the "DVD" tab or "Archive" tab and the "Advanced" button for the highlighted archive device.

8.6.2 Private SOP Class – 3D Presentation State Specification

8.6.2.1 3D Presentation State SOP Class

iE33 provides Standard Conformance to the following Private SOP Class:

Table 89
SOP CLASS FOR PRIVATE 3D PRESENTATION STATE

SOP Class Name	SOP Class UID	SCU	SCP
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Yes	No

8.6.2.2 Association Establishment Policy

8.6.2.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 90
DICOM APPLICATION CONTEXT FOR PRIVATE 3D PRESENTATION STATE

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

8.6.2.2.2 Number of Associations

iE33 initiates one Association at a time for storage of a Private 3D Presentation state.

Table 91
NUMBER OF ASSOCIATIONS INITIATED FOR PRIVATE 3D PRESENTATION STATE

Maximum number of simultaneous Associations	3, one for each configured remote device
---	--

8.6.2.2.3 Asynchronous Nature

iE33 does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 92
ASYNCHRONOUS NATURE AS A SCU FOR PRIVATE 3D PRESENTATION STATE

Maximum number of outstanding asynchronous transactions	1
---	---

8.6.2.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 93
DICOM IMPLEMENTATION CLASS AND VERSION FOR PRIVATE 3D PRESENTATION STATE

Implementation Class UID	1.3.46.670589.5.2.10
Implementation Version Name	ACP1.1L4

8.6.2.3 Association Initiation Policy

8.6.2.3.1 Activity – Store a Private 3D Presentation state

8.6.2.3.2 Description and Sequencing of Activities

The user's selection to store a 3D image initiates the activity to store the 3D Presentation State to the configured and selected remote storage device(s), using standard DICOM C-Store DIMSE commands.

iE33 initiates an Association in order to issue:

— C-STORE request to store 3D Presentation State.

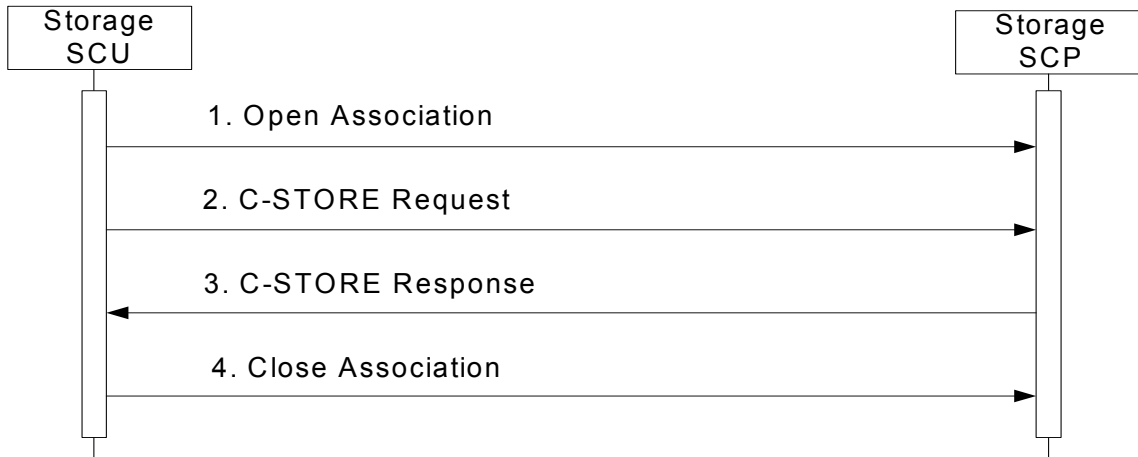


Figure 8a
SEQUENCING OF ACTIVITY – STORE PRIVATE 3D PRESENTATION STATE

8.6.2.3.3 Proposed Presentation Contexts

iE33 will propose Presentation Contexts as shown in the following table:

Table 94
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY STORE PRIVATE 3D PRESENTATION STATE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Private 3D Presentation State	1.3.46.670589.2.5.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

8.6.2.3.4 SOP Specific Conformance for storage of a Private 3D Presentation State

Table 96 summarizes the behavior of iE33 when encountering status codes in a Private 3D Presentation State C-STORE response.

A message will appear on the user interface if iE33 receives any other SCP response status than “Success.”

Table 95
PRIVATE 3D PRESENTATION STATE C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	None	0000	Operations continue
Refused	SOP Class Not Supported	0112	Object is not stored, error message is logged and the user is informed
Failed	Unable to Process	C000 – CFFF	Same as “Refused” above.
*	*	Any other status code.	Same as “Refused” above.

Table 97 contains the tags used in the private 3D Presentation State objects sent when 3D Subpages are stored.

**Table 96
CREATED PRIVATE 3D PRESENTATION STATE OBJECT CONTENTS**

Attribute Name	DICOM Tag	VR	Description
Threedpr Image Layout	200D,3A09	IS	Int value that defines the 3D image layout
Threedpr Xres Filtering Enabled	200D,3A0A	IS	Boolean value for XresFilteringEnabled, Turn Xres on/off
Threedpr Echo Twod Chroma Map Enabled	200D,3A0B	IS	Boolean value for Echo2dChromaMapEnabled, Chroma Map on/off
Threedpr Box Outlined Enabled	200D,3A0C	IS	Boolean value for BoxOutlineEnabled, Turns on or off the display of a 3D box outline in the volume view.
Threedpr Smoothing Enabled	200D,3A0D	IS	Boolean value for SmoothingEnabled, on/off
Threedpr Reference Graphic Enabled	200D,3A0E	IS	Boolean value for ReferenceGraphicEnabled, Turns on or off the display of a Reference graphic in the Volume View.
Threedpr Map Inverted	200D,3A0F	IS	Boolean value for MapInverted, on/off
Threedpr Color Stream Display Enabled	200D,3A10	IS	Indicates whether or not color data is being rendered.
Threedpr Echo Stream Display Enabled	200D,3A11	IS	Indicates whether or not grayscale data is being rendered.
Threedpr Basic Vol Brightness	200D,3A17	IS	Int value for Basic Volume Brightness, The brightness controls how dim or bright the volume appears.
Threedpr Echo Smoothing	200D,3A1A	IS	Int value for EchoSmoothing, A rendering control applied to the volume. The echo smoothing is applied to the echo data, while the color value is applied to the color data.
Threedpr Color Smoothing	200D,3A1B	IS	Int value for ColorSmoothing, A rendering control applied to the volume. The echo smoothing is applied to the echo data, while the color value is applied to the color data.
Threedpr Num Completed Trim Planes	200D,3A1E	IS	Int value for NumCompletedTrimPlanes
Threedpr Depth	200D,3A1F	IS	Int value for Depth, The depth of the MPR view. The depth is defined by the distance from the origin of the data VOI to the intersection point of the MPR views.
Threedpr Wall Filter	200D,3A21	IS	Int value for WallFilter
Threedpr Baseline	200D,3A23	FD	Double value for Baseline

Attribute Name	DICOM Tag	VR	Description
Threedpr Gain	200D,3A24	FD	Double value for Gain. Its intent is to mimic the performance of the acquisition gain control used in 2D but is applied as a visualization parameter.
Threedpr Compress	200D,3A25	FD	Double value for Compress, . Its primary effect is to modify transparency. Its intent is to mimic the performance of the acquisition dynamic range adjustment control used in 2D but is applied as a visualization parameter.
Threedpr Light Brightness	200D,3A26	FD	Double value for LightBrightness
Threedpr Elevation Scale Factor	200D,3A27	FD	Double value for ElevationScaleFactor
Threedpr Zoom Factor	200D,3A28	FD	Double value for ZoomFactor
Threedpr Color Write Priority	200D,3A29	FD	Double value for ColorWritePriority
Threedpr Rotation Angle X	200D,3A2A	FD	Double value for rotation of the active trim plane around the x-axis.
Threedpr Rotation Angle Y	200D,3A2B	FD	Double value for rotation of the active trim plane around the y-axis.
Threedpr Data Voi Center	200D,3A2C	FD	Array of Double value for dataVoiCenter[3],
Threedpr View Translation	200D,3A2D	FD	Array of Double value for ViewTranslation [3].
Threedpr Data Voi Min Point	200D,3A2E	FD	Array of Double value for DataVoiMinPoint[3], The minimum point of the RT VOI.
Threedpr Data Voi Max Point	200D,3A2F	FD	Array of Double value for DataVoiMaxPoint[3], The maximum point of the RT VOI.
Threedpr Box Crop Min Point	200D,3A30	FD	Array of Double value for BoxCropMinPoint[3], The min point of the box crop box. The point is defined in data space where element 0 corresponds to the lateral dimension, element 1 is the depth, and element 2 is elevation. This is read by SIP to define a subset of the data VOI to render.
Threedpr Box Crop Max Point	200D,3A31	FD	Array of Double value for BoxCropMaxPoint[3], The max point of the box crop box. The point is defined in data space where element 0 corresponds to the lateral dimension, element 1 is the depth, and element 2 is elevation. This is read by SIP to define a subset of the data VOI to render.
Threedpr Mpr Rotation Matrix	200D,3A32	FD	Array of Double value for MprRotationMatrix[9], Orientation of the view relative to the Data VOI. One for all MPRs and linked volume, one for unlinked volume.

Attribute Name	DICOM Tag	VR	Description
Threedpr Vol Rotation Matrix	200D,3A33	FD	Array of Double value for VolRotationMatrix[9], The rotation matrix of the active trim plane.
Threedpr Trim Plane Equation	200D,3A34	FD	Array of Double value for TrimPlaneEquations[128], The plane equation of the trim plane the user is currently modifying.
Threedpr Subpage Data Version	200D,3A35	IS	Threed Presentation State Version
Threedpr Is Arbitrary Crop	200D,3A36	IS	Boolean value for IsArbitraryCrop, on/off
Threedpr Arbitrary Crop Dist From Center	200D,3A37	IS	Double value of the distance from the center for arbitrary cropping
Threedpr Arbitrary Crop Rotation Matrix	200D,3A38	FD	Array of Double value for ArbitraryCropRotationMatrix[9]
Threedpr Color Gain	200D,3A39	FD	Double value of the gain for the color box when in Color Full Volume Review
Threedpr Color Wall Filter Index	200D,3A40	IS	An integer value representing the wall filter index when in Color Full Volume Review.
Threedpr Cursor Enabled	200D,3A41	IS	Boolean value of the state of the cursor as displayed on the image, either "on" (show it) or "off"(don't show it)
Threedpr Bondbox Graphic Enabled	200D,3A42	IS	Boolean value of the state of the bounding box on the image, either "on"(show it) or "off"(don't show it)
Threedpr Echo Vision Setting	200D,3402	IS	An integer value representing the active grayscale recipe.
Threedpr Color Vision Setting	200D,3403	IS	An integer value representing the active color recipe
Threedpr Transparency	200D,3404	IS	Grayscale transparency setting.
Threedpr Vision Vol Brightness	200D,3406	FD	Grayscale brightness level. Double value for Vision Volume Brightness
Threedpr Low Threshold	200D,3408	IS	Grayscale threshold level.
Threedpr Opacity Map	200D,340A	IS	Grayscale opacity map setting.
Threedpr Lighting	200D,340C	IS	Diffuse lighting level.
Threedpr Echo Chroma Map Hue	200D,340D	IS	Colorize settings. Values: 0 = OFF, 1 = SEPIA 2 = RAINBOW 3 = THALLIUM 4 = WHEAT 5 = ANGIO

Attribute Name	DICOM Tag	VR	Description
Threedpr Echo Twod Gray Map	200D,340E	IS	Grayscale map setting. Values: 1, 2, 3, 4, and 5
Threedpr Color Map	200D,340F	IS	Color map setting. Values: 1, 2, 3, 4, 5, and 6 Only present for color images.
Dicom Image Date	0008,0023	DA	A reference to the image Date
Dicom Image Time	0008,0033	TM	A reference to the image Time
Dicom Sop Class Uid	0008,0016	UI	A reference to the 3D Presentation State Private Object SOP_CLASS_UID
Dicom Sop Instance Uid	0008,0018	UI	A reference to the 3D Presentation State Private Object SOP_INSTANCE_UID
Dicom Instance Number	0020,0013	IS	A reference to the 3D Presentation State Private Object INSTANCE_NUMBER
Dicom Referenced SOP Class UID	0008,1150	UI	A reference to the image Object SOP_CLASS_UID in which this Presentation State belongs to.
Dicom Referenced SOP Instance UID	0008,1155	UI	A reference to the image Object SOP_INSTANCE_UID in which this Presentation State belongs to.

8.8 PRIVATE TRANSFER SYNTAXES

There are no Private Transfer Syntaxes.

APPENDIX A – Echo Structured Report

A.1 INTRODUCTION

iE33 implements the Adult Echocardiography Procedure Report template (TID 5200) from the DICOM Standard, Part 16, Annex A. This appendix describes the scope and manner that iE33 measurements appear in DICOM reports.

Note: Instead of using the "HAS ACQ CONTEXT" relationship defined in TID 5203, row 5 and 6, the iE33 uses "HAS CONCEPT MOD", as the former is prohibited for Comprehensive SR IOD (ref. PS3.3-2004, Section A.35.3.3.1.2).

A.1.1 Clinical Scope

The supported measurements in the Adult Card Calcs package are accessed when the system is using the transducer and preset combination associated with the exam type in progress, the system is placed in Freeze and the "Analysis" softkey is pressed on the left touch screen. Specific setups for analysis behavior and report pages are available through the Analysis Setups pages. Measurements for a given SR section may come from several sources, and may be used in different calculated values.

Section A.2 shows the relationship between measurement labels used in iE33 Echo reports and the Finding site, Concept Name and Optional Modifiers. DICOM Codes associated with the Finding Site, Concept and Optional Modifiers for Echo SR are located in the section immediately following A.2.

Note: Some measurements are not mapped to DICOM outputs as indicated by "Not mapped" in the mapping table.

A.2 MAPPING FOR ECHOCARDIOGRAPHY DICOM SR – IE33 1.1

Reference for the columns in the mapping table

Finding Site	TID5200, Row 7 through 20, value passed as \$SectionSubject
Concept	TID5200, Row 7 through 20, value passed as \$MeasType
Mode	TID5202, Row 4, value OR TID5203, Row 5, value
Target	TID5203, Row 1, value passed as \$TargetSite
Method	TID5202, Row 6, value passed as \$Method
View	TID5203, Row 6, value
Direction	TID5203, Row 2, value
Phase	TID5203, Row 4, value
Disk	TID5203, Row 4, code Private Extension

New in iE33 1.1:

All instances of a measurement are now exported, in addition to the average, if selected. See the Edit Report page for option selection.

Note: In Analysis setups, it is possible to select multiple results for a single measurement. Default settings are listed in setups via Analysis Config>Adult Echo>Measurements. In most cases, the primary measurement is the only one exported via DICOM. As an example, it is possible to select an automatically derived area measurement based on a single distance. The distance measurement will export, the area will not. Generally, diameter measurements may have an optional area displayed, which will not export.

- Which value selected is communicated using TID310, row 6, Selection Status
- The mean value is encoded using TID300, row 4, Derivation
- Subresults are now exported

Note: In the following section, iE33 labels appear per default settings in Analysis setups. Therefore a given label may appear in more than one table, as may occur on system touch screen displays.

A.2.1 Dimensions

A.2.1.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
RVAWd (2D)	Right Ventricle	Right Ventricular Anterior Wall Diastolic Thickness	mode: 2D mode
RVIDd (2D)	Right Ventricle	Right Ventricular Internal Diastolic Dimension	mode: 2D mode
IVSd (2D)	Left Ventricle	Interventricular Septum Diastolic Thickness	mode: 2D mode
LVIDd (2D)	Left Ventricle	Left Ventricle Internal End Diastolic Dimension	mode: 2D mode
LVPWd (2D)	Left Ventricle	Left Ventricle Posterior Wall Diastolic Thickness	mode: 2D mode
IVSs (2D)	Left Ventricle	Interventricular Septum Systolic Thickness	mode: 2D mode
LVIDs (2D)	Left Ventricle	Left Ventricle Internal Systolic Dimension	mode: 2D mode
LVPWs (2D)	Left Ventricle	Left Ventricle Posterior Wall Systolic Thickness	mode: 2D mode
LVOT Diam	Left Ventricle	Cardiovascular Orifice Diameter	target: Left Ventricle Outflow Tract
AoR Diam (2D)	Aorta	Aortic Root Diameter	mode: 2D mode
LA Dimension (2D)	Left Atrium	Left Atrium Antero-poster Systolic Dimension	mode: 2D mode
RVAWd (MM)	Right Ventricle	Right Ventricular Anterior Wall Diastolic Thickness	mode: M mode
RVIDd (MM)	Right Ventricle	Right Ventricular Internal Diastolic Dimension	mode: M mode
IVSd (MM)	Left Ventricle	Interventricular Septum Diastolic Thickness	mode: M mode
LVIDd (MM)	Left Ventricle	Left Ventricle Internal End Diastolic Dimension	mode: M mode
LVPWd (MM)	Left Ventricle	Left Ventricle Posterior Wall Diastolic Thickness	mode: M mode
IVSs (MM)	Left Ventricle	Interventricular Septum Systolic Thickness	mode: M mode
LVIDs (MM)	Left Ventricle	Left Ventricle Internal Systolic Dimension	mode: M mode
LVPWs (MM)	Left Ventricle	Left Ventricle Posterior Wall Systolic Thickness	mode: M mode
LVOT Diam	Left Ventricle	Cardiovascular Orifice Diameter	mode: M mode, target: Left Ventricle Outflow Tract
AoR Diam (MM)	Aorta	Aortic Root Diameter	mode: M mode
LA Dimension (MM)	Left Atrium	Left Atrium Antero-posterior Systolic Dimension	mode: M mode

HR - LV	Left Ventricle	Heart rate
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A.2.1.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
EDV (2D-Teich)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: 2D mode, method: Teichholz
ESV (2D-Teich)	Left Ventricle	Left Ventricular End Systolic Volume	mode: 2D mode, method: Teichholz
SV (2D-Teich)	Left Ventricle	Stroke Volume	mode: 2D mode, method: Teichholz
FS (2D-Teich)	Left Ventricle	Left Ventricular Fractional Shortening	mode: 2D mode, method: Teichholz
EF (2D-Teich)	Left Ventricle	Left Ventricular Ejection Fraction	mode: 2D mode, method: Teichholz
CO (2D-Teich)	Left Ventricle	Cardiac Output	mode: 2D mode, method: Teichholz
CI (2D-Teich)	Left Ventricle	Cardiac Index	mode: 2D mode, method: Teichholz
SI (2D-Teich)	Left Ventricle	Stroke Index	mode: 2D mode, method: Teichholz
EDV (2D-Cubed)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: 2D mode, method: Cube Method
ESV (2D-Cubed)	Left Ventricle	Left Ventricular End Systolic Volume	mode: 2D mode, method: Cube Method
SV (2D-Cubed)	Left Ventricle	Stroke Volume	mode: 2D mode, method: Cube Method
FS (2D-Cubed)	Left Ventricle	Left Ventricular Fractional Shortening	mode: 2D mode, method: Cube Method
EF (2D-Cubed)	Left Ventricle	Left Ventricular Ejection Fraction	mode: 2D mode, method: Cube Method
CO (2D-Cubed)	Left Ventricle	Cardiac Output	mode: 2D mode, method: Cube Method
CI (2D-Cubed)	Left Ventricle	Cardiac Index	mode: 2D mode, method: Cube Method
SI (2D-Cubed)	Left Ventricle	Stroke Index	mode: 2D mode, method: Cube Method
LA/Ao (2D)	Left Atrium	Left Atrium to Aortic Root Ratio	mode: 2D mode
IVS % (2D)	Left Ventricle	Interventricular Septum % Thickening	mode: 2D mode
LVPW % (2D)	Left Ventricle	Left Ventricle Posterior Wall % Thickening	mode: 2D mode
IVS/LVPW (2D)	Left Ventricle	Interventricular Septum to Posterior Wall Thickness Ratio	mode: 2D mode
LVOT Area	Left Ventricle	Cardiovascular Orifice Area	mode: 2D mode, target: Left Ventricle Outflow Tract
EDV (MM-Teich)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: M mode, method: Teichholz

ESV (MM-Teich)	Left Ventricle	Left Ventricular End Systolic Volume	mode: M mode, method: Teichholz
SV (MM-Teich)	Left Ventricle	Stroke Volume	mode: M mode, method: Teichholz
FS (MM-Teich)	Left Ventricle	Left Ventricular Fractional Shortening	mode: M mode, method: Teichholz
EF (MM-Teich)	Left Ventricle	Left Ventricular Ejection Fraction	mode: M mode, method: Teichholz
CO (MM-Teich)	Left Ventricle	Cardiac Output	mode: M mode, method: Teichholz
CI (MM-Teich)	Left Ventricle	Cardiac Index	mode: M mode, method: Teichholz
SI (MM-Teich)	Left Ventricle	Stroke Index	mode: M mode, method: Teichholz
EDV (MM-Cubed)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: M mode, method: Cube Method
ESV (MM-Cubed)	Left Ventricle	Left Ventricular End Systolic Volume	mode: M mode, method: Cube Method
SV (MM-Cubed)	Left Ventricle	Stroke Volume	mode: M mode, method: Cube Method
FS (MM-Cubed)	Left Ventricle	Left Ventricular Fractional Shortening	mode: M mode, method: Cube Method
EF (MM-Cubed)	Left Ventricle	Left Ventricular Ejection Fraction	mode: M mode, method: Cube Method
CO (MM-Cubed)	Left Ventricle	Cardiac Output	mode: M mode, method: Cube Method
CI (MM-Cubed)	Left Ventricle	Cardiac Index	mode: M mode, method: Cube Method
SI (MM-Cubed)	Left Ventricle	Stroke Index	mode: M mode, method: Cube Method
LA/Ao (MM)	Left Atrium	Left Atrium to Aortic Root Ratio	mode: M mode
IVS % (MM)	Left Ventricle	Interventricular Septum % Thickening	mode: M mode
LVPW % (MM)	Left Ventricle	Left Ventricle Posterior Wall % Thickening	mode: M mode
IVS/LVPW (MM)	Left Ventricle	Interventricular Septum to Posterior Wall Thickness Ratio	mode: M mode
LV Mass (Cubed)	Left Ventricle	Left Ventricle Mass	mode: M mode, method: Cube Method
LV Mass Index (Cubed)	Left Ventricle	Left Ventricle Mass Index	mode: M mode, method: Cube Method

A.2.2 Vessels

A.2.2.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
AoR Diam (2D)	Aorta	Aortic Root Diameter	mode: 2D mode
Asc Aorta Diam	Aorta	Ascending Aortic Diameter	mode: 2D mode
Desc Aorta Diam	Aorta	Descending Aortic Diameter	mode: 2D mode
Ao Arch Diam	Aorta	Aortic Arch Diameter	mode: 2D mode
Ao Isthmus Diam	Aorta	Aortic Isthmus Diameter	mode: 2D mode
MPA Diam	Pulmonary artery	Main Pulmonary Artery Diameter	mode: 2D mode
LPA Diam	Pulmonary artery	Left Pulmonary Artery Diameter	mode: 2D mode
RPA Diam	Pulmonary artery	Right Pulmonary Artery Diameter	mode: 2D mode
RVOT Diam	Right Ventricle	Cardiovascular Orifice Diameter	mode: 2D mode, target: Right Ventricle Outflow Tract

A.2.3 EF and Volume

A.2.3.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
A4Cs	Left Ventricle	Left Ventricle MOD Diam	view: Apical four chamber, phase: End Systole, disk: 1 - 20
A4Cd	Left Ventricle	Left Ventricle MOD Diam	view: Apical four chamber, phase: End Diastole, disk: 1 - 20
A2Cs	Left Ventricle	Left Ventricle MOD Diam	view: Apical two chamber, phase: End Systole, disk: 1 - 20
A2Cd	Left Ventricle	Left Ventricle MOD Diam	view: Apical two chamber, phase: End Diastole, disk: 1 - 20
HR - LV	Left Ventricle	Heart rate	
LVs (A/L)	Not mapped		
LVd (A/L)	Not mapped		

A.2.3.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
LVLd (A4C)	Left Ventricle	Left Ventricle diastolic major axis	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
LVLs (A4C)	Left Ventricle	Left Ventricle systolic major axis	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
LVAAd (A4C)	Left Ventricle	Left Ventricular Diastolic Area	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
LVAs (A4C)	Left Ventricle	Left Ventricular Systolic Area	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
EDV (A4C)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
ESV (A4C)	Left Ventricle	Left Ventricular End Systolic Volume	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane

SV (A4C)	Left Ventricle	Stroke Volume	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
EF (A4C)	Left Ventricle	Left Ventricular Ejection Fraction	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
CO (A4C)	Left Ventricle	Cardiac Output	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
CI (A4C)	Left Ventricle	Cardiac Index	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
SI (A4C)	Left Ventricle	Stroke Index	mode: 2D mode, view: Apical four chamber, method: Method of Disks, Single Plane
LVLd (A2C)	Left Ventricle	Left Ventricle diastolic major axis	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
LVLs (A2C)	Left Ventricle	Left Ventricle systolic major axis	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
LVAd (A2C)	Left Ventricle	Left Ventricular Diastolic Area	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
LVAs (A2C)	Left Ventricle	Left Ventricular Systolic Area	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
EDV (A2C)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
ESV (A2C)	Left Ventricle	Left Ventricular End Systolic Volume	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
SV (A2C)	Left Ventricle	Stroke Volume	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
EF (A2C)	Left Ventricle	Left Ventricular Ejection Fraction	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
CO (A2C)	Left Ventricle	Cardiac Output	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
CI (A2C)	Left Ventricle	Cardiac Index	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
SI (A2C)	Left Ventricle	Stroke Index	mode: 2D mode, view: Apical two chamber, method: Method of Disks, Single Plane
EDV (BP)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: 2D mode, method: Method of Disks, Biplane

ESV (BP)	Left Ventricle	Left Ventricular End Systolic Volume	mode: 2D mode, method: Method of Disks, Biplane
SV (BP)	Left Ventricle	Stroke Volume	mode: 2D mode, method: Method of Disks, Biplane
EF (BP)	Left Ventricle	Left Ventricular Ejection Fraction	mode: 2D mode, method: Method of Disks, Biplane
CO (BP)	Left Ventricle	Cardiac Output	mode: 2D mode, method: Method of Disks, Biplane
CI (BP)	Left Ventricle	Cardiac Index	mode: 2D mode, method: Method of Disks, Biplane
SI (BP)	Left Ventricle	Stroke Index	mode: 2D mode, method: Method of Disks, Biplane
LVLd (A/L)	Left Ventricle	Left Ventricle diastolic major axis	mode: 2D mode, method: Single Plane Ellipse
LVLs (A/L)	Left Ventricle	Left Ventricle systolic major axis	mode: 2D mode, method: Single Plane Ellipse
LVAd (A/L)	Left Ventricle	Left Ventricular Diastolic Area	mode: 2D mode, method: Single Plane Ellipse
LVAs (A/L)	Left Ventricle	Left Ventricular Systolic Area	mode: 2D mode, method: Single Plane Ellipse
EDV (A/L)	Left Ventricle	Left Ventricular End Diastolic Volume	mode: 2D mode, method: Single Plane Ellipse
ESV (A/L)	Left Ventricle	Left Ventricular End Systolic Volume	mode: 2D mode, method: Single Plane Ellipse
SV (A/L)	Left Ventricle	Stroke Volume	mode: 2D mode, method: Single Plane Ellipse
EF (A/L)	Left Ventricle	Left Ventricular Ejection Fraction	mode: 2D mode, method: Single Plane Ellipse
CO (A/L)	Left Ventricle	Cardiac Output	mode: 2D mode, method: Single Plane Ellipse
CI (A/L)	Left Ventricle	Cardiac Index	mode: 2D mode, method: Single Plane Ellipse
SI (A/L)	Left Ventricle	Stroke Index	mode: 2D mode, method: Single Plane Ellipse

A.2.4 Mass

A.2.4.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
LVAd Sax Epi	Left Ventricle	Left Ventricle Epicardial Diastolic Area, psax pap view	view: Parasternal short axis at the Papillary Muscle level
LVAd Sax Endo	Left Ventricle	Left Ventricular Diastolic Area	view: Parasternal short axis at the Papillary Muscle level
LVLd Apical	Left Ventricle	Left Ventricle diastolic major axis	view: Apical four chamber

A.2.4.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
LV Mass (A/L)	Left Ventricle	Left Ventricle Mass	mode: 2D mode
LV Mass Index (A/L)	Left Ventricle	Left Ventricle Mass Index	

A.2.5 Valves

A.2.5.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
LVOT Diam	Left Ventricle	Cardiovascular Orifice Diameter	target: Left Ventricle Outflow Tract
AV Area	Aortic Valve	Cardiovascular Orifice Area	mode: 2D mode, method: Planimetry
AI Radius	Aortic Valve	Flow Radius	direction: Regurgitant Flow
AI Alias Vel	Aortic Valve	Alias Velocity	
MV Diam	Mitral Valve	Cardiovascular Orifice Diameter	mode: 2D mode
MV Area (Planim)	Mitral Valve	Cardiovascular Orifice Area	mode: 2D mode, method: Planimetry
MV Radius	Mitral Valve	Flow Radius	direction: Antegrade Flow
MV Alias Vel	Mitral Valve	Alias Velocity	
MR Radius	Mitral Valve	Flow Radius	direction: Regurgitant Flow
MR Alias Vel	Mitral Valve	Alias Velocity	direction: Regurgitant Flow
TV Diam	Tricuspid Valve	Cardiovascular Orifice Diameter	mode: 2D mode
TV Radius	Tricuspid Valve	Flow Radius	direction: Antegrade Flow
TV Alias Vel	Tricuspid Valve	Alias Velocity	
TR Radius	Tricuspid Valve	Flow Radius	direction: Regurgitant Flow
TR Alias Vel	Tricuspid Valve	Alias Velocity	direction: Regurgitant Flow
RVOT Diam	Right Ventricle	Cardiovascular Orifice Diameter	mode: 2D mode, target: Right Ventricle Outflow Tract

A.2.5.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
MV Area	Not mapped		
LVOT Area	Left Ventricle	Cardiovascular Orifice Area	mode: 2D mode, target: Left Ventricle Outflow Tract
RVOT Area	Right Ventricle	Cardiovascular Orifice Area	mode: 2D mode, target: Right Ventricle Outflow Tract
TV Area	Tricuspid Valve	Cardiovascular Orifice Area	mode: 2D mode

A.2.6 Mitral Valve

A.2.6.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
MV D-E Exc	Mitral Valve	Mitral Valve D-E Excursion	mode: M mode
MV D-E Slope	Mitral Valve	Mitral Valve D-E Slope	mode: M mode

MV E-F Slope	Mitral Valve	Mitral Valve E-F Slope by M-Mode	mode: M mode
MV EPSS	Mitral Valve	Mitral Valve EPSS, E wave	mode: M mode
MV E-E Separation	Mitral Valve	Mitral Valve E-E Separation	mode: M mode
MV A-C Interval	Mitral Valve	Mitral Valve A-C Interval	mode: M mode
MV Dec Slope	Mitral Valve	Deceleration Slope Deceleration Time	direction: Antegrade Flow
MV Peak E Vel	Mitral Valve	Mitral Valve E-Wave Peak Velocity	direction: Antegrade Flow
MV Peak A Vel	Mitral Valve	Mitral Valve A-Wave Peak Velocity	direction: Antegrade Flow
MV Diam	Mitral Valve	Cardiovascular Orifice Diameter	mode: 2D mode
MV VTI	Mitral Valve	Mean Gradient	direction: Antegrade Flow
		Velocity Time Integral Mean Velocity	direction: Antegrade Flow
MV Vmax	Mitral Valve	Peak Velocity	direction: Antegrade Flow
		Peak Gradient	direction: Antegrade Flow
MV Accel Time	Mitral Valve	Acceleration Time	direction: Antegrade Flow
MV Decel Time	Mitral Valve	Deceleration Time	direction: Antegrade Flow
MV A Dur	Mitral Valve	Mitral Valve A-Wave Duration	
IVRT	Left Ventricle	Left Ventricular Isovolumic Relaxation Time	
IVCT	Left Ventricle	Left Ventricular Isovolumic Contraction Time	
LV dP/dt	Mitral Valve	Mitral Regurgitation dP/dt derived from Mitral Reg velocity	
MV P ½ t	Mitral Valve	Pressure Half-Time Peak Velocity Pressure Half-Time	
MR VTI	Mitral Valve	Mean Gradient	direction: Regurgitant Flow
		Velocity Time Integral Mean Velocity	
MR Vmax	Mitral Valve	Peak Velocity	direction: Regurgitant Flow
		Peak Gradient	
HR - MV	Mitral Valve	Heart rate	

A.2.6.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
MVA (VTI)	Mitral Valve	Cardiovascular Orifice Area	method: Continuity Equation by Velocity Time Integral
MVA (P ½ t)	Mitral Valve	Cardiovascular Orifice Area	method: Area by Pressure Half-Time
MVA (PISA)	Mitral Valve	Cardiovascular Orifice Area	method: Proximal Isovelocity Surface Area

MV E/A	Mitral Valve	Mitral Valve E to A Ratio	
PISA (MR)	Mitral Valve	Mitral Valve Flow Area	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
MR Flow Rate	Mitral Valve	Peak Instantaneous Flow Rate	direction: Regurgitant Flow
MR ERO	Mitral Valve	Cardiovascular Orifice Area	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
MR Volume	Mitral Valve	Volume Flow	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
MR Fraction	Mitral Valve	Regurgitant Fraction	direction: Regurgitant Flow
SV (MV)	Mitral Valve	Stroke Volume	
CO (MV)	Mitral Valve	Cardiac Output	
Tei Index	Mitral Valve	Tei Index	

A.2.7 Tricuspid Valve

A.2.7.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
TV D-E Exc	Tricuspid Valve	Tricuspid Valve D-E Excursion	mode: M mode
TV D-E Slope	Tricuspid Valve	Tricuspid Valve D-E Slope	mode: M mode
TV E-F Slope	Tricuspid Valve	Tricuspid Valve E-F Slope	mode: M mode
TV A-C Interval	Tricuspid Valve	Tricuspid Valve A-C Interval	mode: M mode
TV Diam	Tricuspid Valve	Cardiovascular Orifice Diameter	mode: 2D mode
TV Peak E Vel	Tricuspid Valve	Tricuspid Valve E Wave Peak Velocity	direction: Antegrade Flow
TV Peak A Vel	Tricuspid Valve	Tricuspid Valve A Wave Peak Velocity	direction: Antegrade Flow
TV VTI	Tricuspid Valve	Mean Gradient Velocity Time Integral Mean Velocity	direction: Antegrade Flow
TV Vmax	Tricuspid Valve	Peak Velocity Peak Gradient	direction: Antegrade Flow
TV Accel Time	Tricuspid Valve	Acceleration Time	direction: Antegrade Flow
TR VTI	Tricuspid Valve	Mean Gradient Velocity Time Integral Mean Velocity	direction: Regurgitant Flow direction: Regurgitant Flow
TR Vmax	Tricuspid Valve	Peak Velocity Peak Gradient	direction: Regurgitant Flow
RA Pressure	Right Atrium	Right Atrium Systolic Pressure	
HR - TV	Tricuspid Valve	Heart rate	

A.2.7.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
TVA (PISA)	Tricuspid Valve	Cardiovascular Orifice Area	method: Proximal Isovelocity Surface Area
PISA (TR)	Tricuspid Valve	Tricuspid Valve Flow Area	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
TR Flow Rate	Tricuspid Valve	Peak Instantaneous Flow Rate	direction: Regurgitant Flow
TR ERO	Tricuspid Valve	Cardiovascular Orifice Area	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
TR Volume	Tricuspid Valve	Volume Flow	direction: Regurgitant Flow
TR Fraction	Tricuspid Valve	Regurgitant Fraction	direction: Regurgitant Flow
SV(TV)	Tricuspid Valve	Stroke Volume	
CO(TV)	Tricuspid Valve	Cardiac Output	
TV E/A	Tricuspid Valve	Tricuspid Valve E to A Ratio	
RVSP	Right Ventricle	Right Ventricular Peak Systolic Pressure	

A.2.8 Aortic Valve

A.2.8.1 Measurement

iE33 Label	Finding site	Concept	Optional modifiers
AV Cusp Sep	Aortic Valve	Aortic Valve Cusp Separation	mode: M mode
LV Eject Time	Left Ventricle	Eject Time	mode: M mode
LV Pre-Eject Period	Left Ventricle	Pre-Eject Time	mode: M mode
LVOT Diam	Left Ventricle	Cardiovascular Orifice Diameter	target: Left Ventricle Outflow Tract
LVOT VTI	Left Ventricle	Mean Gradient Velocity Time Integral Mean Velocity	target: Left Ventricle Outflow Tract
LVOT Vmax	Left Ventricle	Peak Velocity Peak Gradient	target: Left Ventricle Outflow Tract
LVOT Accel Time	Left Ventricle	Acceleration Time	target: Left Ventricle Outflow Tract
AV VTI	Aortic Valve	Mean Gradient Velocity Time Integral Mean Velocity	direction: Antegrade Flow
AV Vmax	Aortic Valve	Peak Velocity Peak Gradient	direction: Antegrade Flow
AV Accel Time	Aortic Valve	Acceleration Time	direction: Antegrade Flow
AV Decel Time	Aortic Valve	Deceleration Time	direction: Antegrade Flow
AI VTI	Aortic Valve	Mean Gradient Velocity Time Integral Mean Velocity	direction: Regurgitant Flow

AI Vmax	Aortic Valve	Peak Velocity Peak Gradient	direction: Regurgitant Flow
AI End Dias Vel	Aortic Valve	End Diastolic Velocity	direction: Regurgitant Flow
AI Accel Time	Aortic Valve	Acceleration Time	direction: Regurgitant Flow
AI P ½ t	Aortic Valve	Pressure Half-Time	direction: Regurgitant Flow
HR - AV	Aortic Valve	Heart rate	
AI Dec Slope	Aortic Valve	Deceleration Slope Deceleration Time	direction: Regurgitant Flow

A.2.8.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
LV PEP/ET	Left Ventricle	PEP/ET	
AVA(Vmax)	Aortic Valve	Cardiovascular Orifice Area	method: Continuity Equation by Peak Velocity
AVA(VTI)	Aortic Valve	Cardiovascular Orifice Area	method: Continuity Equation by Velocity Time Integral
PISA (AI)	Aortic Valve	Aortic Valve Flow Area	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
AI Flow Rate	Aortic Valve	Peak Instantaneous Flow Rate	direction: Regurgitant Flow
AI ERO	Aortic Valve	Cardiovascular Orifice Area	method: Proximal Isovelocity Surface Area, direction: Regurgitant Flow
AI Volume	Aortic Valve	Volume Flow	direction: Regurgitant Flow
AI Fraction	Aortic Valve	Regurgitant Fraction	direction: Regurgitant Flow
SV (LVOT)	Left Ventricle	Stroke Volume	target: Left Ventricle Outflow Tract
CO (LVOT)	Left Ventricle	Cardiac Output	target: Left Ventricle Outflow Tract
Qp/Qs	Cardiac Shunt Study	Pulmonary-to-Systemic Shunt Flow Ratio	

A.2.9 Pulmonic Valve

A.2.9.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
Late Dias Slope	Pulmonic Valve	Late Diastolic Slope	mode: M mode
A Wave Amp	Pulmonic Valve	A Wave Amp	mode: M mode
B-C Slope	Pulmonic Valve	B-C Slope	mode: M mode
RV Eject Time	Right Ventricle	Eject Time	mode: M mode
RV Pre-Eject Period	Right Ventricle	Pre-Eject Time	mode: M mode
RVOT Diam	Right Ventricle	Cardiovascular Orifice Diameter	mode: 2D mode, target: Right Ventricle Outflow Tract

RVOT VTI	Right Ventricle	Mean Gradient Velocity Time Integral Mean Velocity	target: Right Ventricle Outflow Tract
RVOT Vmax	Right Ventricle	Peak Velocity Peak Gradient	target: Right Ventricle Outflow Tract
PV VTI	Pulmonic Valve	Mean Gradient Velocity Time Integral Mean Velocity	direction: Antegrade Flow
PV Vmax	Pulmonic Valve	Peak Velocity Peak Gradient	direction: Antegrade Flow
PV Accel Time	Pulmonic Valve	Acceleration Time	direction: Antegrade Flow
PI End Dias Vel	Pulmonic Valve	End Diastolic Velocity	direction: Regurgitant Flow
HR - PV	Pulmonic Valve	Heart rate	

A.2.9.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
RV PEP/ET	Right Ventricle	PEP/ET	
PVA (Vmax)	Pulmonic Valve	Cardiovascular Orifice Area	method: Continuity Equation by Peak Velocity
PVA (VTI)	Pulmonic Valve	Cardiovascular Orifice Area	method: Continuity Equation by Velocity Time Integral
SV (RVOT)	Right Ventricle	Stroke Volume	target: Right Ventricle Outflow Tract
CO (RVOT)	Right Ventricle	Cardiac Output	target: Right Ventricle Outflow Tract
Qp/Qs	Cardiac Shunt Study	Pulmonary-to-Systemic Shunt Flow Ratio	

A.2.10 Pulmonic and Hepatic Veins

A.2.10.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
Pulm Sys Vel	Pulmonary Venous Structure	Pulmonary Vein Systolic Peak Velocity	
Pulm Dias Vel	Pulmonary Venous Structure	Pulmonary Vein Diastolic Peak Velocity	
Pulm A Revs Vel	Pulmonary Venous Structure	Pulmonary Vein Atrial Contraction Reversal Peak Velocity	
Pulm A Revs Dur	Pulmonary Venous Structure	Pulmonary Vein A-Wave Duration	
Hepatic Sys Vel	Hepatic Veins	Hepatic Vein Systolic Peak Velocity	
Hepatic Dias Vel	Hepatic Veins	Hepatic Vein Diastolic Peak Velocity	

Hepatic A Revs Vel	Hepatic Veins	Hepatic Vein Atrial Contraction Reversal Peak Velocity
Hepatic A Revs Dur	Hepatic Veins	Hepatic Vein A-Wave Duration

A.2.10.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
Pulm S/D	Pulmonary Venous Structure	Pulmonary Vein Systolic to Diastolic Ratio	
Hepatic S/D	Hepatic Veins	Hepatic Vein Systolic to Diastolic Ratio	

A.2.11 TDI

A.2.11.1 Measurements

iE33 Label	Finding site	Concept	Optional modifiers
MV Peak E Vel	Not mapped		
MV Peak A Vel	Not mapped		
Med E` Vel	Not mapped		
Lat E` Vel	Not mapped		
Med S Vel	Not mapped		
Med A` Vel	Not mapped		
Lat S Vel	Not mapped		
Lat A` Vel	Not mapped		
Area Under Med E`	Not mapped		
Area Under Med A`	Not mapped		
Area Under Lat E`	Not mapped		
Area Under Lat A`	Not mapped		
Time to Med E`	Not mapped		
Time to Lat E`	Not mapped		
Time to Med S	Not mapped		
Time to Lat S	Not mapped		
Med Accel Time	Not mapped		
Med Decel Time	Not mapped		
Lat Accel Time	Not mapped		
Lat Decel Time	Not mapped		
Med IVCT	Not mapped		
Med IVRT	Not mapped		
Lat IVCT	Not mapped		
Lat IVRT	Not mapped		

A.2.11.2 Calculations

iE33 Label	Finding site	Concept	Optional modifiers
MV E/A	Not mapped		

E/E` Lateral	Not mapped
E/E` Medial	Not mapped
E`/A` Lateral	Not mapped
E`/A` Medial	Not mapped

A.2.12 Private Code Dictionary for Echo

Coding Scheme Designator	Code Value	Code Meaning
99PMSBLUS	T5200-01	Hepatic Veins
99PMSBLUS	C12201-01	Left Ventricle MOD Diam
99PMSBLUS	C12203-01	Left Ventricle Mass Index
99PMSBLUS	C12203-02	Eject Time
99PMSBLUS	C12203-03	Pre-Eject Time
99PMSBLUS	C12203-04	PEP/ET
99PMSBLUS	C12207-01	Mitral Valve D-E Excursion
99PMSBLUS	C12207-02	Mitral Valve D-E Slope
99PMSBLUS	C12207-03	Mitral Valve E-E Separation
99PMSBLUS	C12207-04	Mitral Valve A-C Interval
99PMSBLUS	C12207-05	Tei Index
99PMSBLUS	C12207-06	Mitral Valve Flow Area
99PMSBLUS	C12208-01	Tricuspid Valve D-E Excursion
99PMSBLUS	C12208-02	Tricuspid Valve D-E Slope
99PMSBLUS	C12208-03	Tricuspid Valve E-F Slope
99PMSBLUS	C12208-04	Tricuspid Valve A-C Interval
99PMSBLUS	C12208-05	Tricuspid Valve Flow Area
99PMSBLUS	C12209-01	Late Diastolic Slope
99PMSBLUS	C12209-02	A Wave Amp
99PMSBLUS	C12209-03	B-C Slope
99PMSBLUS	C12211-01	Aortic Valve Flow Area
99PMSBLUS	C12216-01	Hepatic Vein A-Wave Duration
99PMSBLUS	C12222-01	Flow Radius
99PMSBLUS	C12222-02	Alias Velocity
99PMSBLUS	C12222-03	Pressure Half-Time Peak velocity

Private Code(s) Retired in iE33 1.1

99PMSBLUS	T5200-02	Private Concepts
99PMSBLUS	C12220-01	Heart Rate for All Points
99PMSBLUS	C12220-02	Heart Rate for CO-MOD
99PMSBLUS	C12220-03	Heart Rate for CO-A/L
99PMSBLUS	C12220-04	Heart Rate for CO-LVOT
99PMSBLUS	C12220-05	Heart Rate for CO-MV
99PMSBLUS	C12220-06	Heart Rate for CO-RVOT

The code tables of this section follow the format convention of the DICOM Standard, Part 16 Annex A, 2004

The following format is used to privately extend the Echo Context groups.

Private extensions to the Echo templates

Extensions to TID 5200

	NL	Relation with Parent	Value Type	Concept Name	VM	Req Type	Cond	Value Set Constraint
4	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	1	U		\$SectionSubject = EV (99PMSBLUS, T5200-01, "Hepatic Veins") \$MeasType = DCID (12216) Echocardiography Hepatic Veins

Extension to TID 5203

	NL	Relation with Parent	Value Type	Concept Name	VM	Req Type	Cond	Value Set Constraint
4	>	HAS CONCEPT MOD	TEXT	EV (99PMSBLUS, T5203-01, "Simpson's Disk Number")	1	M C		IFF \$Measurement = (99PMSBLUS, C12201-01, "Left Ventricle MOD Diam")

Private Extension(s) Retired with iE33 1.1

4	>	CONTAINS	INCLUDE	DTID (5202) Echo Section	1	U		\$SectionSubject = EV (99PMSBLUS, T5200-02, "Private Concepts") \$MeasType = DCID (12220) Echocardiography Common Measurements
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Extended Echocardiography Context Groups from PS3-16, Annex C, 2004

Context groups from the DCMR have been extended with Private Codes listed as 99PMSBLUS used between iE33 and Xcelera workstations.

CID 12200 – Echocardiography Left Ventricle

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

CID 12201 – Left Ventricle Linear

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
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	18155-2	Interventricular Septum to Posterior Wall Thickness Ratio
LN	18054-7	Interventricular Septum % Thickening
LN	18158-6	Interventricular Septum Systolic Thickness
LN	18053-9	Left Ventricle Posterior Wall % Thickening
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

CID 12202 – Left Ventricle Volume

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	18026-5	Left Ventricular End Diastolic Volume
LN	18148-7	Left Ventricular End Systolic Volume
LN	18043-0	Left Ventricular Ejection Fraction

CID 12203 – Left Ventricle Other

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	18087-7	Left Ventricle Mass
LN	18071-1	Left Ventricular Isovolumic Relaxation Time
SRT	G-037E	Left Ventricular Isovolumic Contraction Time
99PMSBLUS	C12203-01	Left Ventricle Mass Index
99PMSBLUS	C12203-02	Eject Time
99PMSBLUS	C12203-03	Pre-Eject Time
99PMSBLUS	C12203-04	PEP/ET

CID 12204 – Echocardiography Right Ventricle

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

CID 12205 – Echocardiography Left Atrium

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	29469-4	Left Atrium Antero-posterior Systolic Dimension
LN	17985-3	Left Atrium to Aortic Root Ratio

CID 12206 – Echocardiography Right Atrium

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	18070-3	Right Atrium Systolic Pressure

CID 12207 – Echocardiography Mitral Valve

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
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
SRT	G-0385	Mitral Valve A-Wave Duration
LN	18035-6	Mitral Regurgitation dP/dt derived from Mitral Reg velocity
99PMSBLUS	C12207-01	Mitral Valve D-E Excursion
99PMSBLUS	C12207-02	Mitral Valve D-E Slope
99PMSBLUS	C12207-03	Mitral Valve E-E Separation
99PMSBLUS	C12207-04	Mitral Valve A-C Interval
99PMSBLUS	C12207-05	Tei Index
99PMSBLUS	C12207-06	Mitral Valve Flow Area

CID 12208 – Echocardiography Tricuspid Valve

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
LN	18031-5	Tricuspid Valve E Wave Peak Velocity
LN	18030-7	Tricuspid Valve A Wave Peak Velocity
LN	18039-8	Tricuspid Valve E to A Ratio
99PMSBLUS	C12208-01	Tricuspid Valve D-E Excursion
99PMSBLUS	C12208-02	Tricuspid Valve D-E Slope
99PMSBLUS	C12208-03	Tricuspid Valve E-F Slope
99PMSBLUS	C12208-04	Tricuspid Valve A-C Interval
99PMSBLUS	C12208-05	Tricuspid Valve Flow Area

CID 12209 – Echocardiography Pulmonic Valve

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
99PMSBLUS	C12209-01	Late Diastolic Slope
99PMSBLUS	C12209-02	A Wave Amp
99PMSBLUS	C12209-03	B-C Slope

CID 12210 – Echocardiography Pulmonary Artery

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	18020-8	Main Pulmonary Artery Diameter
LN	18021-6	Right Pulmonary Artery Diameter
LN	18019-0	Left Pulmonary Artery Diameter

CID 12211 – Echocardiography Aortic Valve

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
INCLUDE CID 12222 Orifice Flow Properties		
LN	17996-0	Aortic Valve Cusp Separation
99PMSBLUS	C12211-01	Aortic Valve Flow Area

CID 12212 – Echocardiography Aorta

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	18015-8	Aortic Root Diameter
LN	18011-7	Aortic Arch Diameter
LN	18012-5	Ascending Aortic Diameter
LN	18014-1	Aortic Isthmus Diameter
LN	18013-3	Descending Aortic Diameter

CID 12214 – Echocardiography Pulmonary Veins

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	29450-4	Pulmonary Vein Systolic Peak Velocity
LN	29451-2	Pulmonary Vein Diastolic Peak Velocity
LN	29452-0	Pulmonary Vein Systolic to Diastolic Ratio
LN	29453-8	Pulmonary Vein Atrial Contraction Reversal Peak Velocity
SRT	G-038B	Pulmonary Vein A-Wave Duration

CID 12216 – Echocardiography Hepatic Veins

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	29471-0	Hepatic Vein Systolic Peak Velocity
LN	29472-8	Hepatic Vein Diastolic Peak Velocity
LN	29473-6	Hepatic Vein Systolic to Diastolic Ratio
LN	29474-4	Hepatic Vein Atrial Contraction Reversal Peak Velocity
99PMSBLUS	C12216-01	Hepatic Vein A-Wave Duration

CID 12217 – Echocardiography Cardiac Shunt

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
INCLUDE CID 12220 Echocardiography Common Measurements		
LN	29462-9	Pulmonary-to-Systemic Shunt Flow Ratio

CID 12220 – Echocardiography Common Measurements

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	8867-4	Heart rate

CID 12221 – Flow Direction

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	R-42047	Antegrade Flow
SRT	R-42E61	Regurgitant Flow

CID 12222 – Orifice Flow Properties

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
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	11653-3	End Diastolic Velocity
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

CID 12223 – Echocardiography Stroke Volume Origin

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SNM3	T-32650	Left Ventricle Outflow Tract
SNM3	T-32550	Right Ventricle Outflow Tract

CID 12224 – Ultrasound Image Modes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	G-03A2	2D mode
SRT	G-0394	M mode

CID 12226 – Echocardiography Image View

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	G-A19B	Apical two chamber
SRT	G-A19C	Apical four chamber
SRT	G-039B	Parasternal short axis at the Papillary Muscle level

CID 12228 – Volume Methods

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

CID 12229 – Area Methods

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	125210	Area by Pressure Half-Time
DCM	125214	Continuity Equation by Peak Velocity
DCM	125215	Continuity Equation by Velocity Time Integral
DCM	125216	Proximal Isovelocity Surface Area
DCM	125220	Planimetry

CID 12231 – Volume Flow Methods

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	125216	Proximal Isovelocity Surface Area

CID 12233 – Cardiac Phase

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	F-32011	End Diastole
DCM	109070	End Systole

CID 12239 – Cardiac Output Properties

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	F-32120	Stroke Volume
SRT	F-32100	Cardiac Output
SRT	F-32110	Cardiac Index
SRT	F-00078	Stroke Index

CID 12240 – Left Ventricle Area

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

APPENDIX B Vascular Structured Report

B.1 INTRODUCTION

iE33 implements the Vascular Report template (TID 5100). This appendix describes the scope and manner that iE33 measurements appear in DICOM reports.

B.1.1 Clinical Scope

According to the DICOM Vascular Template (TID 5100), vascular measurements appear in a hierarchy of regional sections (e.g. Left Vein of Lower Extremity) that contain groups of anatomically specific containers (e.g. Common Femoral Vein). The groups contain the measurements or calculations that apply to that group. A group may contain measurement when it is an anatomically non-specific, such as a ratio of velocities from different vessels.

B.2 MAPPING FOR VASCULAR DICOM SR – IE33 1.1

Reference for the columns in the mapping table

Section Scope TID5100, Row 9 through 29, value passed as \$SectionScope

Anatomy Group TID5100, Row 9 through 29, value passed as \$Anatomy

Vessel Segment TID5104, Row 2

Vessel Branch TID5104, Row 3

B.2.1 Carotid

iE33 Label	Section Scope	Anatomy Group	Vessel Segment
Prox CCA	Artery of neck	Common Carotid Artery	Proximal
Mid CCA	Artery of neck	Common Carotid Artery	Mid-longitudinal
Dist CCA	Artery of neck	Common Carotid Artery	Distal
Prox ICA	Artery of neck	Internal Carotid Artery	Proximal
Mid ICA	Artery of neck	Internal Carotid Artery	Mid-longitudinal
Dist ICA	Artery of neck	Internal Carotid Artery	Distal
Prox ECA	Artery of neck	External Carotid Artery	Proximal
Vertebral A	Artery of neck	Vertebral Artery	
Bulb	Artery of neck	Carotid Bulb	
CCA - ratio	Not mapped		
ICA - ratio	Not mapped		
Brachioceph A	Artery Of Upper Extremity	Innominate Artery	
Prox SCL A	Artery of neck	Subclavian Artery	Proximal
ICA/CCA Ratio	Artery of neck	ICA/CCA velocity ratio	

B.2.2 Lower Extremity Arterial

iE33 Label	Section Scope	Anatomy Group	Vessel Segment
Int Iliac A	Artery of Lower Extremity	Internal Iliac Artery	
Com Iliac A	Artery of Lower Extremity	Common Iliac Artery	

Ext Iliac A	Artery of Lower Extremity	External Iliac Artery	
CFA	Artery of Lower Extremity	Common Femoral Artery	
Prox PFA	Artery of Lower Extremity	Profunda Femoris Artery	
Prox SFA	Artery of Lower Extremity	Superficial Femoral Artery	Proximal
Mid SFA	Artery of Lower Extremity	Superficial Femoral Artery	Mid-longitudinal
Dist SFA	Artery of Lower Extremity	Superficial Femoral Artery	Distal
Prox Pop A	Artery of Lower Extremity	Popliteal Artery	Proximal
Dist Pop A	Artery of Lower Extremity	Popliteal Artery	Distal
Prox ATA	Artery of Lower Extremity	Anterior Tibial Artery	Proximal
Mid ATA	Artery of Lower Extremity	Anterior Tibial Artery	Mid-longitudinal
Dist ATA	Artery of Lower Extremity	Anterior Tibial Artery	Distal
Dor Pedis	Artery of Lower Extremity	Dorsalis Pedis Artery	
Prox PTA	Artery of Lower Extremity	Posterior Tibial Artery	Proximal
Mid PTA	Artery of Lower Extremity	Posterior Tibial Artery	Mid-longitudinal
Dist PTA	Artery of Lower Extremity	Posterior Tibial Artery	Distal
Prox Pero A	Artery of Lower Extremity	Peroneal Artery	Proximal
Mid Pero A	Artery of Lower Extremity	Peroneal Artery	Mid-longitudinal
Dist Pero A	Artery of Lower Extremity	Peroneal Artery	Distal

B.2.3 Lower Extremity Venous

iE33 Label	Section Scope	Anatomy Group	Vessel Segment	Vessel Branch
Com Iliac V	Vein of Lower Extremity	Common Iliac Vein		
Ext Iliac V	Vein of Lower Extremity	External Iliac Vein		
Int Iliac V	Vein of Lower Extremity	Internal iliac vein		
CFV	Vein of Lower Extremity	Common Femoral Vein		
SFJ	Vein of Lower Extremity	Saphenofemoral Junction		
Prox DPF V	Vein of Lower Extremity	Profunda Femoris Vein	Proximal	

Prox SFV	Vein of Lower Extremity	Superficial Femoral Vein	Proximal
Mid SFV	Vein of Lower Extremity	Superficial Femoral Vein	Mid-longitudinal
Dist SFV	Vein of Lower Extremity	Superficial Femoral Vein	Distal
Prox Pop V	Vein of Lower Extremity	Popliteal Vein	Proximal
Mid Pop V	Vein of Lower Extremity	Popliteal Vein	Mid-longitudinal
Dist Pop V	Vein of Lower Extremity	Popliteal Vein	Distal
Prox ATV	Vein of Lower Extremity	Anterior Tibial Vein	Proximal
Mid ATV	Vein of Lower Extremity	Anterior Tibial Vein	Mid-longitudinal
Dist ATV	Vein of Lower Extremity	Anterior Tibial Vein	Distal
Prox PTV	Vein of Lower Extremity	Posterior Tibial Vein	Proximal
Mid PTV	Vein of Lower Extremity	Posterior Tibial Vein	Mid-longitudinal
Dist PTV	Vein of Lower Extremity	Posterior Tibial Vein	Distal
Prox Pero V	Vein of Lower Extremity	Peroneal Vein	Proximal
Mid Pero V	Vein of Lower Extremity	Peroneal Vein	Mid-longitudinal
Dist Pero V	Vein of Lower Extremity	Peroneal Vein	Distal
Prox GSV Thigh	Vein of Lower Extremity	Great Saphenous Vein of Thigh	Proximal
Mid GSV Thigh	Vein of Lower Extremity	Great Saphenous Vein of Thigh	Mid-longitudinal
Dist GSV Thigh	Vein of Lower Extremity	Great Saphenous Vein of Thigh	Distal
Prox GSV Calf	Vein of Lower Extremity	Great Saphenous Vein of Calf	Proximal
Mid GSV Calf	Vein of Lower Extremity	Great Saphenous Vein of Calf	Mid-longitudinal
Dist GSV Calf	Vein of Lower Extremity	Great Saphenous Vein of Calf	Distal
Prox LSV	Vein of Lower Extremity	Lesser Saphenous Vein	Proximal
Mid LSV	Vein of Lower Extremity	Lesser Saphenous Vein	Mid-longitudinal
Dist LSV	Vein of Lower Extremity	Lesser Saphenous Vein	Distal
Med Sural V	Vein of Lower Extremity	Gastrocnemius vein	Medial
Lat Sural V	Vein of Lower Extremity	Gastrocnemius vein	Lateral

B.2.4 Upper Extremity Arterial

iE33 Label	Section Scope	Anatomy Group	Vessel Segment
Ax A	Artery Of Upper Extremity	Axillary Artery	
Prox Brach A	Artery Of Upper Extremity	Brachial Artery	Proximal
Dist Brach A	Artery Of Upper Extremity	Brachial Artery	Distal
Prox Ulnar A	Artery Of Upper Extremity	Ulnar Artery	Proximal
Mid Ulnar A	Artery Of Upper Extremity	Ulnar Artery	Mid-longitudinal
Dist Ulnar A	Artery Of Upper Extremity	Ulnar Artery	Distal
Prox Rad A	Artery Of Upper Extremity	Radial Artery	Proximal

Mid Rad A	Artery Of Upper Extremity	Radial Artery	Mid-longitudinal
Dist Rad A	Artery Of Upper Extremity	Radial Artery	Distal
Mid SCL A	Artery Of Upper Extremity	Subclavian Artery	Mid-longitudinal
Antecube	Artery Of Upper Extremity	Antecube	

B.2.5 Upper Extremity Venous

iE33 Label	Section Scope	Anatomy Group	Vessel Segment
IJV	Vein Of Upper Extremity	Internal Jugular vein	
Brachioceph V	Vein Of Upper Extremity	Innominate vein	
Prox SCL V	Vein Of Upper Extremity	Subclavian vein	Proximal
Mid SCL V	Vein Of Upper Extremity	Subclavian vein	Mid-longitudinal
Ax V	Vein Of Upper Extremity	Axillary vein	
Prox Brach V	Vein Of Upper Extremity	Brachial vein	Proximal
Dist Brach V	Vein Of Upper Extremity	Brachial vein	Distal
Prox Ulnar V	Vein Of Upper Extremity	Ulnar vein	Proximal
Mid Ulnar V	Vein Of Upper Extremity	Ulnar vein	Mid-longitudinal
Dist Ulnar V	Vein Of Upper Extremity	Ulnar vein	Distal
Prox Rad V	Vein Of Upper Extremity	Radial vein	Proximal
Mid Rad V	Vein Of Upper Extremity	Radial vein	Mid-longitudinal
Dist Rad V	Vein Of Upper Extremity	Radial vein	Distal
Prox Ceph V	Vein Of Upper Extremity	Cephalic vein	Proximal
Mid Ceph V	Vein Of Upper Extremity	Cephalic vein	Mid-longitudinal
Dist Ceph V	Vein Of Upper Extremity	Cephalic vein	Distal
Prox Basilic V	Vein Of Upper Extremity	Basilic vein	Proximal
Mid Basilic V	Vein Of Upper Extremity	Basilic vein	Mid-longitudinal
Dist Basilic V	Vein Of Upper Extremity	Basilic vein	Distal

B.2.6 Grafts

iE33 Label	Section Scope	Anatomy Group
Inflow Vessel	Not mapped	
Outflow Vessel	Not mapped	
Prox Anast	Not mapped	
Prox Gft	Not mapped	
Mid Gft	Not mapped	
Dist Gft	Not mapped	
Dist Anast	Not mapped	
Dist Outflow Vess	Not mapped	
Pre Anast Artery	Not mapped	
Post Anast Artery	Not mapped	
Anast	Not mapped	
Pre Anast Vein	Not mapped	

Post Anast Vein	Not mapped
Composite Site	Not mapped

B.2.7 Private Code Dictionary for Vascular

Coding Scheme Designator	Code Value	Code Meaning
99PMSBLUS	sup71_001	Antecube

The following section describes the Codes associated with Vascular measurements and calculations.

The tables below lists which context groups and their contents specified by TID 5100 used in this implementation.

CID - 12104 Extracranial Arteries

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	T-45170	Carotid Bulb
SRT	T-45100	Common Carotid Artery
SRT	T-45200	External Carotid Artery
SRT	T-45300	Internal Carotid Artery
SRT	T-46100	Subclavian Artery
SRT	T-45700	Vertebral Artery

CID - 12107 Upper Extremity Arteries

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	T-47100	Axillary Artery
SRT	T-47160	Brachial Artery
SRT	T-46010	Innominate Artery
SRT	T-47300	Radial Artery
SRT	T-46100	Subclavian Artery
SRT	T-47200	Ulnar Artery
99PMSBLUS	sup71_001	Antecube

CID - 12108 Upper Extremity Veins

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	T-49110	Axillary vein
SRT	T-48052	Basilic vein
SRT	T-49350	Brachial vein
SRT	T-49240	Cephalic vein
SRT	T-48620	Innominate vein
SRT	T-48170	Internal Jugular vein
SRT	T-49340	Radial vein

SRT	T-48330	Subclavian vein
SRT	T-49330	Ulnar vein

CID - 12109 Lower Extremity Arteries

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	T-46710	Common Iliac Artery
SRT	T-47700	Anterior Tibial Artery
SRT	T-47400	Common Femoral Artery
SRT	T-47741	Dorsalis Pedis Artery
SRT	T-46910	External Iliac Artery
SRT	T-46740	Internal Iliac Artery
SRT	T-47630	Peroneal Artery
SRT	T-47500	Popliteal Artery
SRT	T-47600	Posterior Tibial Artery
SRT	T-47440	Profunda Femoris Artery
SRT	T-47403	Superficial Femoral Artery

CID - 12110 Lower Extremity Veins (this table additionally references DICOM CP499*)

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	T-49630	Anterior Tibial Vein
SRT	G-035B	Common Femoral Vein
SRT	T-48920	Common Iliac Vein
SRT	T-48930	External Iliac Vein
SRT	T-4942D	Gastrocnemius vein
SRT	R-10259	Great Saphenous Vein of Thigh *
SRT	R-1025A	Great Saphenous Vein of Calf *
SRT	T-49550	Lesser Saphenous Vein
SRT	T-49650	Peroneal Vein
SRT	T-49640	Popliteal Vein
SRT	T-49620	Posterior Tibial Vein
SRT	T-49660	Profunda Femoris Vein
SRT	T-D930A	Saphenofemoral Junction
SRT	G-035A	Superficial Femoral Vein
SRT	T-48940	Internal iliac vein

*CP 499 table modification date: 20050110

CID - 12116 Vessel Segment Modifiers

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	G-A119	Distal

SRT	G-A188	Mid-longitudinal
SRT	G-A118	Proximal

CID - 12117 Vessel Branch Modifiers

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
SRT	G-A104	Lateral
SRT	G-A101	Left
SRT	G-A109	Medial
SRT	G-A100	Right

CID - 12120 Blood Velocity Measurements

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	11653-3	End Diastolic Velocity
LN	11665-7	Minimum Diastolic Velocity
LN	11726-7	Peak Systolic Velocity
LN	20352-1	Time averaged mean velocity
LN	11692-1	Time averaged peak velocity

CID - 12121 Vascular Indices and Ratios

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	20167-3	Acceleration Index
LN	12008-9	Pulsatility Index
LN	12023-8	Resistivity Index
LN	12144-2	Systolic to Diastolic Velocity Ratio

CID - 12122 Other Vascular Properties

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	20168-1	Acceleration Time
LN	20217-6	Deceleration Time

CID - 12123 Carotid Ratios

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
LN	33868-1	ICA/CCA velocity ratio

APPENDIX C – 3D VOLUME PRIVATE TAG LIST

C.1 3D VOLUME IMAGE PRIVATE TAG DESCRIPTION

The private tags listed in this section are intended for analysis of iE33 3D datasets.

Attribute Name	DICOM Tag	VR	Description
Private Native Threed Data Sequence ⁽¹⁾	200D,3016	SQ	Contains private Native Threed Data object Array
Private Native Data Type	200D,300D	LO	Contains data type of Native Data such as UDM_USD_DATATYPE_DIN_3D_ECHO, UDM_USD_DATATYPE_DIN_PHYSIO
Private Native Total Num Sample	200D,3010	IS	An integer value that defines the total number of native data sample
Native Data Sample Size	200D,3011	IS	An integer value that defines the native data sample size
Private Native Data Stream Array	200D,3020	SQ	Contains Bulk data and instance number.
Private Native Data Stream	200D,300E	OB	Contains Native Data Bulk data such as 3D Echo Volume, 3D Color Volume and Physio.
Private Native Data Instance Num	200D,3021	IS	An integer value that defines the instance number of the private data. For example, the instance number of Biplane is 2.
Vdb Param Echo 3d Estimate Dimension ⁽²⁾	200D,3315	LO	Defines the number of data points in each dimension (ρ , θ , ϕ , t) of the echo volume. List of 4 integers. First three values are the size in voxels in the $\rho\theta\phi$ dimensions of the volume(s). . Last value (t dimension)
Vdb Param Echo 3d Estimate Pitch ⁽²⁾	200D,3316	LO	Pitch (aka stride) of the color volume data in each dimension. List of 3 integers.
Vdb Param Echo 3d Estimate Scale ⁽²⁾	200D,3317	LO	Scale (aka spatial or temporal offset) of the volume data in each dimension. List of 4 doubles.
Vdb Param Echo 3d Estimate Apex Position ⁽²⁾	200D,3318	LO	Transducer apex position relative to the first voxel in the volume, in voxels. List of 3 doubles. Last value (t dimension) is always 0.

⁽¹⁾ 3D Native Data Sequence.

Attribute Name	DICOM Tag	VR	Description
Vdb Param Color 3d Estimate Dimension ⁽²⁾	200D,3610	LO	Defines the number of data points in each dimension of the color volume. List of 4 integers. Only present for color images. <i>If present, value matches that of the Volume Dimension tag (color volume is currently always the same size as the echo volume).</i>
Vdb Param Color 3d Estimate Pitch ⁽²⁾	200D,3611	LO	Pitch (aka stride) of the color volume data in each dimension. List of 3 integers. Only present for color images. <i>If present, value matches that of the Volume Pitch tag (color volume is currently always the same size as the echo volume).</i>
Vdb Param Color 3d Estimate Scale ⁽²⁾	200D,3612	LO	Scale (aka spatial or temporal offset) of the color volume data in each dimension. List of 4 doubles. Only present for color images. <i>If present, value matches that of the Volume Scale tag (color volume is currently always the same size as the echo volume).</i>
Vdb Param Color 3d Estimate Apex Position ⁽¹⁾	200D,3613	LO	Transducer apex position relative to the first voxel in the color volume, in voxels. List of 3 doubles. Last value (t dimension) is always 0. Only present for color images. <i>If present, value matches that of the Apex Position tag (color volume is currently always the same size as the echo volume).</i>
Vdb Param Color 3d Estimate Color Offset	200D,3614	LO	Offset in voxels at which the color volume data starts with respect to the echo volume data (values may be fractional). List of 4 doubles. Only present for color images. <i>If present, value is 0\0\0\0 (color volume is currently always the same size as the echo volume).</i>
Vdb Threed Estimate Num Dimensions	200D,330a	UL	Value = 4 (ρ , θ , ϕ , t)
Vdb Param Matrix Encryption Random Number	200D,3920	LO	A generated random number used in encryption algorithm.

END OF DOCUMENT