DICOM Conformance Statement

Product Name: ACUSON Freestyle Ultrasound System

Release: VA41

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https://www.siemens.com/DICOM

SIEMENS Healthineers

1 CONFORMANCE STATEMENT OVERVIEW

The **ACUSON Freestyle™ Ultrasound System** with DICOM option supports the following DICOM Application Entities:

- Verification
  - Verification AE
- Transfer
  - Storage AE
  - Storage Commitment AE
- Workflow Management
  - Worklist AE
  - MPPS AE

Table 1-1:
Network Services

SOP Classes	Service Class User (SCU)	Service Class Provider (SCP)
VERIFICATION		
Verification AE		
Verification	Yes	Yes
TRANSFER		
Storage AE		
Ultrasound Image Storage	Yes	No
Ultrasound Multi-frame Image Storage	Yes	No
Storage Commitment AE		
Storage Commitment Push Model	Yes	No
WORKFLOW MANAGEMENT		
Worklist AE		
Modality Worklist	Yes	No
MPPS AE		
MPPS (N-Create, N-Set)	Yes	No

Table 1-2:
UID Values

SOP Class Name	SOP Class UID	Category
Verification AE		
Verification	1.2.840.10008.1.1	Verification
Storage AE		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Transfer
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Transfer
Storage Commitment AE		
Storage Commitment Push Model	**1.2.840.10008.1.20.1**	Transfer
Worklist AE		
Modality Worklist	1.2.840.10008.5.1.4.31	Workflow Management

SOP Class Name	SOP Class UID	Category
MPPS AE		
MPPS (N-Create, N-Set)	1.2.840.10008.3.1.2.3.3	Workflow Management

Table 1-3:
Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Ultrasound USB Interchange: Single and Multi-Frame Image Display With Spatial Calibration		
STD-US-SC-MF-USB	Yes	No

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3 INTRODUCTION

This document describes the conformance to the ACR-NEMA DICOM 3.0 Standard by the ACUSON Freestyle ™ ultrasound system, version VA41 with DICOM option from Siemens Healthineers. It shall establish the conformance specifications for this system only, and does not apply to other products offered by Siemens Healthineers or its affiliates.

The ACUSON Freestyle™ system is a device that generates ultrasound images that can be sent using DICOM standard protocols and definitions to other DICOM compliant devices that support the SOP classes defined in Table 4.1.

This document is written with respect to the adopted portions of the DICOM standard, Version 3. The following sections of this document follow the outline specified in the DICOM Standard NEMA publication PS3.2.[1]

3.1 Audience

This document is written for the people that need to understand how the ACUSON Freestyle™ system will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between the ACUSON Freestyle™ system and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard.

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 as SCU and SCP, respectively.

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

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 Standard [1]. 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.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

[1] Source: DICOM® Standards Publication Part 2, © NEMA. The DICOM Standard is under continuous maintenance. The current official version is available at http://dicom.nema.org.

- The standard will evolve to meet the users' future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most recent product information.

3.3 Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definition of these terms.

Abstract Syntax – The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

ACUSON Freestyle™ system – The ultrasound system described by this DICOM Conformance Statement.

Application Entity (AE) – An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – The externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – The specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – A network communication channel set up between *Application Entities*.

Attribute – A unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Attribute Macro - A set of Attributes that are described in a single table that is referenced by multiple Module or other tables.

Information Object Definition (IOD) – A data abstraction of a class of similar Real-World Objects which defines the nature and attributes relevant to the class of Real-World objects represented. Examples: US Image IOD, CT Image IOD, Print Job IOD.

Integrating the Healthcare Enterprise (IHE) – An initiative sponsored by the Radiological Society of North America (RSNA) to document and demonstrate standards-based methods of sharing information in support of optimal patient care. For additional information, see www.rsna.org/ihe.

Functional Group - A set of logically related Attributes that are likely to vary together. May be used in Multi-frame IODs to describe parameters which change on a per frame basis.

Joint Photographic Experts Group (JPEG) – Joint Photographic Experts Group, The group was organized in 1986, issuing a standard in 1992, which was approved in 1994 as ISO 10918-1. The JPEG standard is used by DICOM applications.

Media Application Profile – The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs), see DICOM PS3.11.

Module – A set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes (among others) Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – First phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Picture Archiving and Communications Systems (PACS) – A DICOM server that accepts medical images from another DICOM system and stores the images for later retrieval.

Presentation Context – The set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – A packet (piece) of a DICOM message sent across the network. It contains protocol control information and user data. Devices must specify the maximum size packet they can receive for DICOM messages.

Request (RQ) – A request from one DICOM AE for service from another DICOM AE.

Response (RSP) – A response from one DICOM AE to the request for service from another DICOM AE.

Security Profile – A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) – The role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (Image Storage SCP, and image query/retrieve SCP), Radiology Information System (Modality Worklist SCP).

Service Class User (SCU) – The role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class – The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – An information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].

Transfer Syntax – The encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – A globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.4 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts.* The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (*PDU*) size, security information, and network service options (called *Extended Negotiation* information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a USB memory device). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

3.5 Abbreviations

ACR	American College of Radiology
AE	DICOM Application Entity
AET	DICOM Application Entity Title
ASCII	American Standard Code for Information Interchange
DB	Database
DCS	DICOM Conformance Statement
DIMSE	DICOM Message Service Element
DSF	Decompressed Single Frame (ACUSON Freestyle™ export option)
FSC	Interchange Media File Set Creator
FSU	Interchange Media File Set Updater
HIS	Hospital Information System
ILE	Implicit Little Endian transfer syntax
IOD	DICOM Information Object Definition
MPPS	Modality Performed Procedure Step
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
PACS	Picture Archiving and Communications Systems
PDU	DICOM Protocol Data Unit
RIS	Radiology Information System
RWA	Real-World Activity
SC	Storage Commitment
SCP	DICOM Service Class Provider (DICOM server)
SCU	DICOM Service Class User (DICOM client)
SOP	DICOM Service-Object Pair
UID	Unique identifier
US	Ultrasound

3.6 References

[1] DICOM® Standards Publication, PS 3.1 – PS 3.18, © NEMA. The DICOM Standard is under continuous maintenance. The current official version is available at http://dicom.nema.org.

4 NETWORKING

This section describes the ACUSON Freestyle™ networking services.

4.1 Implementation Model

ACUSON Freestyle™ users can store images directly on the system's storage device. Images can also be transferred to DICOM workstations and archive servers on a network. Storage Commitment can be used to insure that patient images and data are safely committed. The system is capable of querying a HIS/RIS, using DICOM Basic Worklist Management Service, for a list of scheduled patient procedures. Performed procedure status and other procedure information can be returned to the HIS/RIS using Modality Performed Procedure Step (MPPS).

4.1.1 Application Data Flow

Figure 4-1 provides a functional overview of the ACUSON Freestyle™ system's Application Entities (AE). Relationships between user invoked activities (in the circles at the left of the AE) and the associated real-world activities provided by DICOM service providers (in the circles on the right side of the diagram) are shown.

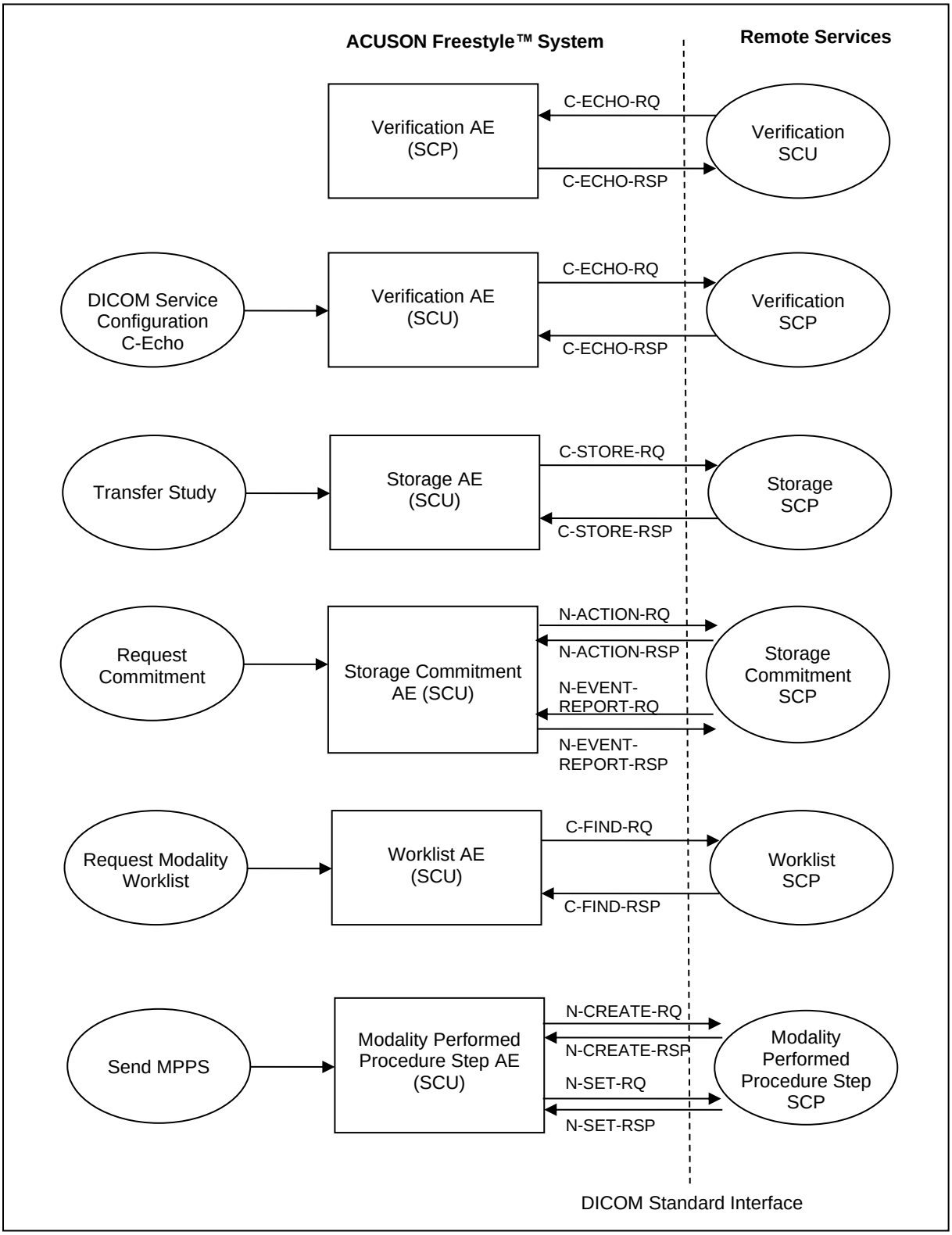


Figure 4-1**. Implementation Model**

4.1.2 Functional Definition of AE's

4.1.2.1 Verification AE

Verification is available in the DICOM setup page. Verification can be used to send a DICOM verification request (C-ECHO) to a remote Application Entity (AE) and will listen for a response. Verification on the ACUSON Freestyle™ can be performed as an SCU or an SCP.

When the Verification SCU is invoked, the following messages are returned to the user:

- DICOM C-ECHO successful
- Could not establish association
- DICOM C-ECHO timed out

4.1.2.2 Storage AE

The ACUSON Freestyle™ acts as a SCU for the C-STORE DICOM network service.

As an SCU, the ACUSON Freestyle™ Storage Application Entity originates associations for transfer of DICOM Ultrasound single and multiframe images.

The system supports automatic and manual storage of saved images. Manual transfers can be initiated through the export dialog, opened from the Study List page. If configured for automatic transfer, the system will transfer images on study close.

The "on study close" method lets the user store studies more accurately in the server. It is a common practice in Ultrasound to delete some images or modify demographic data before the study is closed.

In the event that the ACUSON Freestyle™ is taken off the network as a portable system or when a network failure occurs during a background store, the Storage SCU maintains a queue of failed C-STORE requests. The queue is retried upon power cycling of the ACUSON Freestyle™.

4.1.2.3 Storage Commitment AE

The ACUSON Freestyle™ serves as a SCU for the DICOM Storage Commitment service. In order for the ACUSON Freestyle™ to send the Storage Commitment message, at least one Storage Commitment server must be configured in the system and the a Server must be selected in the Storage Commitment Destination combo box on the Export Dialog.

DICOM Storage Commitment is negotiated after all images have been successfully stored to a DICOM Store SCP.

ACUSON Freestyle™ uses the DICOM Storage Commitment Push Model to inform the server when all stores for a study have been completed. The Storage Commitment SCU uses the N-ACTION primitive to make a request to the SCP for safekeeping of a set of SOP instances (e.g.: Ultrasound images).

The ACUSON Freestyle™ Storage Commitment SCU also performs a role reversal and becomes the SCP for the N-EVENT-REPORT primitives received from the original SCP (now an SCU).

4.1.2.4 Modality Worklist AE

Patient registration can be automated by using the 'Worklist' Real World Activity. Pressing the ‘Patient’ button on the imaging screen displays the patient registration page. Pressing the 'Worklist' button on this page invokes the Worklist Query screen. The ‘Worklist’ button will only be visible if one or more Worklist servers are configured in the system.

The worklist query can be customized by modifying fields on the Worklist Query page. Patient name fields that are partially filled or empty will be treated as though an implicit wildcard was appended at the end of each field. Patient ID and Accession number fields will be exact match only.

Once a Worklist query is initiated, the Query Status field will be updated to indicate “In Progress”. The user has the option to press the Cancel button, which will abort the query operation. If no matches are found, the Query Status field will be updated to indicate that zero responses were received. If one or more matching patients are found, a pick list of patient exams will be displayed to the user. Each of the fields can be sorted in ascending and descending order.

The user will have the option of selecting a patient study or canceling the operation. Selection of a patient from the list will cause all demographic information for that patient to be loaded in the patient registration screen.

4.1.2.5 Modality Performed Procedure Step AE

The ACUSON Freestyle™ Modality Performed Procedure Step (MPPS) sends event transactions that facilitate the transfer of procedure status and billing information from the ultrasound system to the information system. MPPS is triggered at the start of a study and at the end of a study.

The MPPS AE supports both the N-CREATE and N-SET DIMSE Service Elements. The N-CREATE message is sent at the start of a study and the N-SET is sent when a study is closed.

4.1.3 Sequencing of Real-World Activities

This section describes the sequencing of Real-World Activities performed by the Application Entities using a UML sequence diagram. Real-World Activities are depicted as vertical bars and arrows show the events exchanged between them.

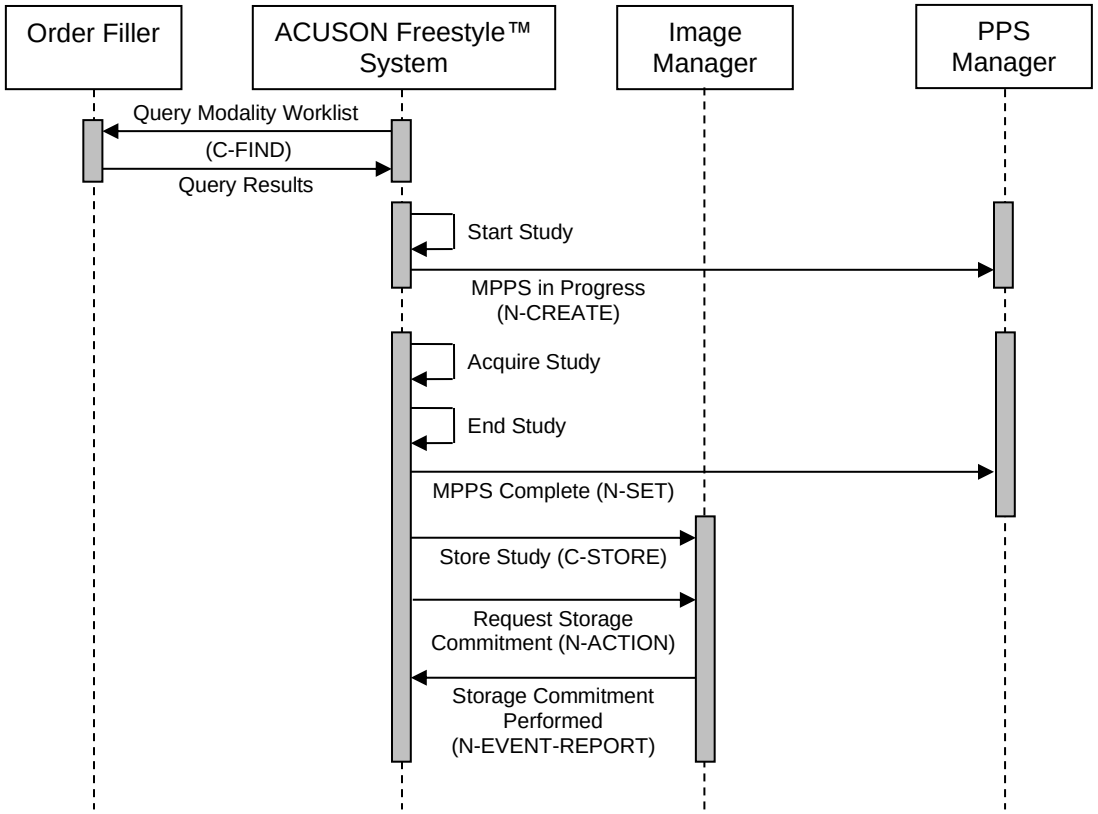


Figure 4-2. Sequence Diagram for Real-World Activities

4.2 AE Specifications

4.2.1 Storage AE

4.2.1.1 SOP Classes

Table 4-1:
SOP Classes for Storage AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Storage SOP Classes			
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No

4.2.1.2 Association Policies

4.2.1.2.1 General

Table 4-2:
DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.1.2.2 Number Of Associations

Table 4-3:
Number of Associations as an Association Initiator for Storage AE

Maximum number of simultaneous associations	1

4.2.1.2.3 Asynchronous Nature

All associations use the default synchronous mode of operation. Asynchronous Operations Window negotiations are not supported on the ACUSON Freestyle™.

4.2.1.2.4 Implementation Identifying Information

Table 4-4:
DICOM Implementation Class for Storage AE

Implementation Class UID	1.3.12.2.1107.5.5.16

4.2.1.3 Association Initiation Policy (Storage SCU)

Table 4-5:
Association Initiation Policy for Storage AE

Operation or Real-World Activity	Association for
Export Study	C-STORE

4.2.1.3.1 Activity "Export Study"

4.2.1.3.1.1 Description and Sequencing of Activities

Storage of a DICOM object to an external entity is triggered from the study list page when one or more studies are selected and the "Export" button is pressed or upon study close if auto-send is configured. In either case, a C-STORE request is initiated to the selected C-STORE SCP..

If an association to a remote Application Entity could successfully be established, each image will be transferred one after another via the same open association.

Studies that have failed to export are retried when the system is power cycled.

4.2.1.3.1.2 Proposed Presentation Contexts

For all supported images (see SOP Classes in Table 4.1), the following Transfer Syntaxes are supported.

Table 4-6:
Store Presentation Context

Abstract Syntax		Transfer Syntax	
Name	**UID**	**Name List**	**UID List**
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2
		JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50

4.2.1.3.1.3 Photometric Interpretation

Photometric Interpretation (color mode of the pixel image data) is not a negotiable parameter in DICOM 3.0. The Photometric Interpretation Attribute (0028,0004) is set depending on the transfer syntax and the system configuration.

Table 4-7:
Photometric Interpretation

SOP Class		Transfer Syntax		Photometric Interpretation
Name	**UID**	**Name List**	**UID List**	
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Implicit VR Little Endian	1.2.840.10008.1.2	RGB
		JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50	YBR_FULL_422
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossy (Baseline)	1.2.840.10008.1.2.4.50	YBR_FULL_422

4.2.1.3.1.4 SOP Specific Conformance to SOP Classes

Refer to section 8.1.1, Created SOP Instances, for a detailed list of attributes.

Table 4-8:
DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	Sending partially or completely failed	Any none null Code	Failure and / or error code reported to user and storage job is cancelled.
Success	Image is successfully stored on file system.	0000	Success reported to user

Table 4-9:
DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user
Association Aborted	Failure reported to user and the storage job is cancelled.

4.2.1.4 Association Acceptance Policy

Storage AE does not accept association requests.

4.2.2 Storage Commitment AE

4.2.2.1 SOP Classes

Table 4-10:
SOP Classes for Storage Commitment AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Storage Commitment SOP Classes			
Storage Commitment Push Model	**1.2.840.10008.1.20.1**	Yes	No

4.2.2.2 Association Policies

4.2.2.2.1 General

Table 4-11:
DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2 Number of Associations

Table 4-12:
Number of Associations as an Association Initiator for Storage Commitment AE

Maximum number of simultaneous associations	1

4.2.2.2.3 Asynchronous Nature

All associations use the default synchronous mode of operation. Asynchronous Operations Window negotiations are not supported on the ACUSON Freestyle™.

4.2.2.2.4 Implementation Identifying Information

Table 4-13:
DICOM Implementation Class for Storage Commitment AE

Implementation Class UID	1.3.12.2.1107.5.5.16

4.2.2.3 Association Initiation Policy (Storage Commitment SCU)

Table 4-14:
Association Initiation Policy for Storage Commitment AE

Operation or Real-World Activity	Association for
Storage Commitment	N-ACTION-RQ

4.2.2.3.1 Activity “Send Storage Commitment”

4.2.2.3.1.1 Description and Sequencing of Activities

After sending a study (images) to the C-STORE SCP, the ACUSON Freestyle™ will initiate an association to the selected Storage Commitment SCP. This association will be used to send the N_ACTION_RQ to the SCP.

4.2.2.3.1.2 Proposed Presentation Contexts

Table 4-15:
Proposed Presentation Contexts for Storage Commitment AE

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

There is no extended negotiation as an SCU.

4.2.2.3.1.3 SOP Specific Conformance to SOP Classes

Table 4-16:
DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	No Retry on Failure	Any none null Code	Failure reported to user
Success	Storage Commitment Reply noticed.	0000	Success reported to user

Table 4-17:
DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user
Association Aborted	Failure reported to user

4.2.2.3.2 Activity "Receive Storage Commitment Report"

4.2.2.3.2.1 Description and Sequencing of Activities

The ACUSON Freestyle™ accepts the N-EVENT-REPORT-RQ on a separate association from the N-ACTION-RQ.

4.2.2.3.2.2 Proposed Presentation Contexts

Table 4-18:
Proposed Presentation Contexts for Storage Commitment AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

There is no extended negotiation as an SCP.

4.2.2.3.2.3 SOP Specific Conformance for SOP Classes

Table 4-19:
DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	No retry on failure.	Any none null Code	Failure to commit reported to user,
Success	Storage Commitment Reply noticed.	0000	Success reported to user.

4.2.2.4 Association Acceptance Policy

The Storage Commitment AE does not accept association requests.

4.2.3 Worklist AE

4.2.3.1 SOP Classes

This Application Entity provides Standard Conformance to the SOP Classes listed in the table below.

Table 4-20:
SOP Classes for Worklist AE

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported Worklist SOP Classes			
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

4.2.3.2 Association Policies

4.2.3.2.1 General

Table 4-21:
DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2 Number of Associations

Table 4-22:
Number of Associations as an Association Initiator for Worklist AE

Maximum number of simultaneous associations	1

4.2.3.2.3 Asynchronous Nature

All associations use the default synchronous mode of operation. Asynchronous Operations Window negotiations are not supported on the ACUSON Freestyle™.

4.2.3.2.4 Implementation Identifying Information

Table 4-23:
DICOM Implementation Class and Version for Worklist AE

Implementation Class UID	1.3.12.2.1107.5.5.16

4.2.3.3 Association Initiation Policy

Table 4-24:
Association Policy for Worklist AE

Operation or Real-World Activity	Association for
Modality Worklist Query	C-FIND

4.2.3.3.1 Activity "Modality Worklist Query"

4.2.3.3.1.1 Description and Sequencing of Activities

The ACUSON Freestyle™ user initiates a Modality Worklist C-FIND Query from the Worklist page by pressing the "Query" button. The user may configure the query by entering information in various fields on the Worklist page.

When the system successfully establishes an association to the remote application entity, the C-FIND-RQ will be sent and the results will be displayed by the system. A preset number of maximum matching results are accepted, at which point, the ACUSON Freestyle™ AE issues a C-FIND-CANCEL request.

4.2.3.3.1.2 Proposed Presentation Contexts

Table 4-25:
Proposed Presentation Contexts for Worklist AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist-FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	No

There is no extended negotiation as an SCU.

4.2.3.3.1.3 SOP Specific Conformance to Modality Worklist Service SOP Class

The following table lists the user configurable matching attributes used in the Broad Query of the Modality Worklist (C-FIND).

Table 4-26:
Modality Worklist Matching Key Attributes (Broad Query)

RIS Server Configuration	Attribute Name	Tag	Query Value
	Scheduled Procedure Step Sequence	(0040,0100)	
Scheduled Station	>Scheduled Station AE Title	(0040,0001)	If selected, set to the AE Title of the ACUSON Freestyle™ system issuing the C-FIND-RQ
SPS Start Date Interval	>Scheduled Procedure Step Start Date	(0040,0002)	Selections are: Today/Yesterday, Today, Last 3 days, Yesterday, Tomorrow, All
Modality	>Modality	(0008,0060)	Selections are: US, All, or user configurable

The following table lists the user configurable matching attributes used in the Patient Query of the Modality Worklist (C-FIND).

Table 4-27:
Modality Worklist Matching Key Attributes (Patient Based Query)

Worklist Data View Field	Attribute Name	Tag	Query Value
Requested Procedure ID	Requested Procedure ID	(0040,1001)	As entered in the “Requested Procedure ID” field.
Accession Number	Accession Number	(0008,0050)	As entered in the “Accession Number” field.
Patient’s Name	Patient’s Name	(0010,0010)	As entered in the “Last Name” and / or “First Name” fields.
Patient ID	Patient ID	(0010,0020)	As entered in the “Patient ID” field.
Scheduled Start Date	Scheduled Procedure Step Sequence >Scheduled Procedure Step Start Date	(0040,0100) >(0040,0002)	As selected in the “Exam Date” field.
Modality	Scheduled Procedure Step Sequence >Modality	(0040,0100) >(0008,0060)	As selected or entered in the "Modality" fields.
Station AE Title	Scheduled Procedure Step Sequence >Scheduled Station AE Title	(0040,0100) >(0040,0001)	Selected by the “AET Filter” combo box.

Table 4-28:
Modality Worklist C_FIND_RSP Return Key Attributes

Attribute Name	Tag	Return Key Type	Displayable on UI
SOP Common			
Specific Character Set	(0008,0005)	1C	
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	1	
>Scheduled Station AE Title	(0040,0001)	1	Yes
>Scheduled Procedure Step Start Date	(0040,0002)	1	Yes
>Scheduled Procedure Step Start Time	(0040,0003)	1	Yes
>Modality	(0008,0060)	1	Yes
>Scheduled Performing Physician’s Name	(0040,0006)	2	

Attribute Name	Tag	Return Key Type	Displayable on UI
>Scheduled Procedure Step Description	(0040,0007)	1C	Yes
>Scheduled Station Name	(0040,0010)	2	
>Scheduled Procedure Step Location	(0040,0011)	2	
>Scheduled Protocol Code Sequence	(0040,0008)	1C	
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	3	
>>Code Meaning	(0008,0104)	3	
>Pre-Medication	(0040,0012)	2C	
>Scheduled Procedure Step ID	(0040,0009)	1	Yes
>Requested Contrast Agent	(0032,1070)	2C	
>Scheduled Procedure Step Status	(0040,0020)	3	
>Comments on the Scheduled Procedure Step	(0040,0400)	3	
Requested Procedure			
Requested Procedure ID	(0040,1001)	1	Yes
Requested Procedure Description	(0032,1060)	1C	Yes
Requested Procedure Code Sequence	(0032,1064)	1C	
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Study Instance UID	(0020,000D)	1	
Referenced Study Sequence	(0008,1110)	2	
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient Transport Arrangements	(0040,1004)	2	
Reason for the Requested Procedure	(0040,1002)	3	
Requested Procedure Priority	(0040,1003)	2	
Confidentiality Code	(0040,1008)	3	
Reporting Priority	(0040,1009)	3	
Names of Intended Recipients of Results	(0040,1010)	3	
Requested Procedure Comments	(0040,1400)	3	Yes
Imaging Service Request			
Accession Number	(0008,0050)	2	Yes
Requesting Physician	(0032,1032)	2	Yes
Referring Physician's Name	(0008,0090)	2	Yes
Imaging Service Request Comments	(0040,2400)	3	Yes

Attribute Name	Tag	Return Key Type	Displayable on UI
Requesting Service	(0032,1033)	3	
Issuing Date of Imaging Service Request	(0040,2004)	3	
Issuing Time of Imaging Service Request	(0040,2005)	3	
Order Entered By	(0040,2008)	3	
Order Enterer Location	(0040,2009)	3	
Order Callback Phone Number	(0040,2010)	3	
Order Placer Issuer and Number	(0040,2016)	2	
Order Filler Issuer and Number	(0040,2017)	2	
Visit Identification			
Admission ID	(0038,0010)	2	Yes
Institution Name	(0008,0080)	3	Yes
Institution Address	(0008,0081)	3	Yes
Visit Status			
Current Patient Location	(0038,0300)	2	Yes
Visit Relationship			
Referenced Patient Sequence	(0008,1120)	2	
>Referenced SOP Class UID	(0008,1150)	2	
>Referenced SOP Instance UID	(0008,1155)	2	
Visit Admission			
Admitting Diagnoses Description	(0008,1080)	3	Yes
Patient Identification			
Patient's Name	(0010,0010)	1	Yes
Patient ID	(0010,0020)	1	Yes
Other Patient IDs	(0010,1000)	3	Yes
Other Patient Names	(0010,1001)	3	Yes
Medical Record Locator	(0010,1090)	3	Yes
Patient Demographic			
Patients Birthdate	(0010,0030)	2	Yes
Patient's Sex	(0010,0040)	2	Yes
Patient's Age	(0010,1010)	3	Yes
Patient's Size	(0010,1020)	3	Yes
Patient's Weight	(0010,1030)	2	Yes
Military Rank	(0010,1080)	3	Yes
Branch Of Service	(0010,1081)	3	Yes
Confidentiality constraint on patient data	(0040,3001)	2	Yes
Patient's Address	(0010,1040)	3	Yes
Patient's Telephone Numbers	(0010,2154)	3	Yes
Ethnic Group	(0010,2160)	3	Yes

Attribute Name	Tag	Return Key Type	Displayable on UI
Patient Comments	(0010,4000)	3	Yes
Patient Medical			
Special Needs	(0038,0050)	3	Yes
Patient State	(0038,0500)	2	Yes
Pregnancy Status	(0010,21C0)	2	Yes
Medical Alerts	(0010,2000)	2	Yes
Allergies	(0010,2110)	2	Yes
Smoking Status	(0010,21A0)	3	Yes
Last Menstrual Date	(0010,21D0)	3	Yes
Additional Patient History	(0010,21B0)	3	Yes

4.2.3.3.1.4 SOP Specific Conformance to SOP Classes

Table 4-29:
DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Error	No Modality Worklist results saved	Any none null Code	Failure reported to user
Success	Modality Worklist results saved on system	0000	Success reported to user

Table 4-30:
DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user

4.2.3.4 Association Acceptance Policy

The Worklist AE does not accept Association requests.

4.2.4 MPPS AE

4.2.4.1 SOP Classes

The MPPS AE provides Standard Conformance to the SOP classes listed in the table below.

Table 4-31:
SOP Classes for MPPS

SOP Class Name	SOP Class UID	User of Service (SCU)	Provider of Service (SCP)
Supported MPPS SOP Classes			
MPPS (N-Create, N-Set)	1.2.840.10008.3.1.2.3.3	Yes	No

4.2.4.2 Association Policies

4.2.4.2.1 General

Table 4-32:
DICOM Application Context

Application Context Name	1.2.840.10008.3.1.1.1

4.2.4.2.2 Number of Associations

Table 4-33:
Number of Associations as an Association Initiator for MPPS AE

Maximum number of simultaneous associations	1

4.2.4.2.3 Asynchronous Nature

All associations use the default synchronous mode of operation. Asynchronous Operations Window negotiations are not supported on the ACUSON Freestyle™.

4.2.4.2.4 Implementation Identifying Information

Table 4-34:
DICOM Implementation Class and Version for MPPS AE

Implementation Class UID	1.3.12.2.1107.5.5.16

4.2.4.3 Association Initiation Policy

Table 4-35:
Association Initiation Policy for MPPS AE

Operation or Real-World Activity	Association for
Study Creation	N-CREATE
Study End	N-SET

4.2.4.3.1 Activity "Send MPPS"

4.2.4.3.1.1 Description and Sequencing of Activities

The ACUSON Freestyle™ supports the DICOM Modality Performed Procedure Step Service as an SCU. The Modality Performed Procedure Step SCU informs the Performed Procedure Step SCP about the procedure performed at the modality using the N-CREATE and N-SET DIMSE services.

Immediately after a new study is created from a Modality Worklist response, the ACUSON Freestyle™ automatically performs an MPPS N-CREATE-RQ operation with a status of IN-PROGRESS for the newly created Performed Procedure Step. When the current patient procedure ends (either with an Study Close, or start of a new study), the ACUSON Freestyle™ will prompt the user to select a completion status of COMPLETE or DISCONTINUED. The MPPS N-SET-RQ is then sent with the selected status.

4.2.4.3.1.2 Proposed Presentation Contexts

Table 4-36:
Proposed Presentation Contexts for MPPS AE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

There is no extended negotiation as an SCU.

4.2.4.3.1.3 SOP Specific Conformance to SOP Classes

Refer to sections 8.1.1.3 and 8.1.1.4 for a detailed list of attributes.

If the N-CREATE message is not sent successfully, it will be retried at the time the N-SET is sent.

Table 4-37:
DICOM Command Response Status Handling Behavior

Service Status	Further Meaning	Error Code	Behavior
Failure	If N-CREATE-RQ fails, it is retried before N-SET-RQ is sent. If N-SET fails, study must be reopened, then closed.	Any none null Code	Failure reported to user
Success	N-CREATE-RQ or N-SET-RQ accepted by MPPS SCP	0000	Success logged

Table 4-38:
DICOM Command Communication Failure Behavior

Exception	Behavior
Timeout	Failure reported to user
Association Aborted	Failure reported to user

4.2.4.4 Association Acceptance Policy

The MPPS AE does not accept association requests

4.3 Network Interfaces

4.3.1 Physical Network Interface

The ACUSON Freestyle™ is independent from the physical medium over which TCP/IP executes; it inherits this from the OS system upon which it executes.

4.3.2 Additional Protocols

None.

4.3.3 IPV4 and IPv6 Support

Only IPv4 is supported.

4.4 Configuration

The DICOM settings used by the ACUSON Freestyle™ are configured from the DICOM setup page accessed from the System page. The network settings for both the wired and wireless networks are configured from the Network setup page.

4.4.1 ACUSON Freestyle™ TCP/IP Settings

The following TCP/IP Settings can be configured for both the wired and wireless networks used by the ACUSON Freestyle™:

- IP Address
- Subnet Mask
- Gateway
- Auto IP
- Security settings for wireless networks

4.4.2 ACUSON Freestyle™ DICOM Settings

The following settings for the ACUSON Freestyle™ DICOM AEs can be configured:

- AE Title
- DICOM port number

4.4.3 DICOM Settings for Remote DICOM AEs

Remote DICOM AEs for Storage, Storage Commitment, Modality Worklist and MPPS can be configured with the following settings:

- IP Address
- AE Title
- Port number
- Alias
- Set as default

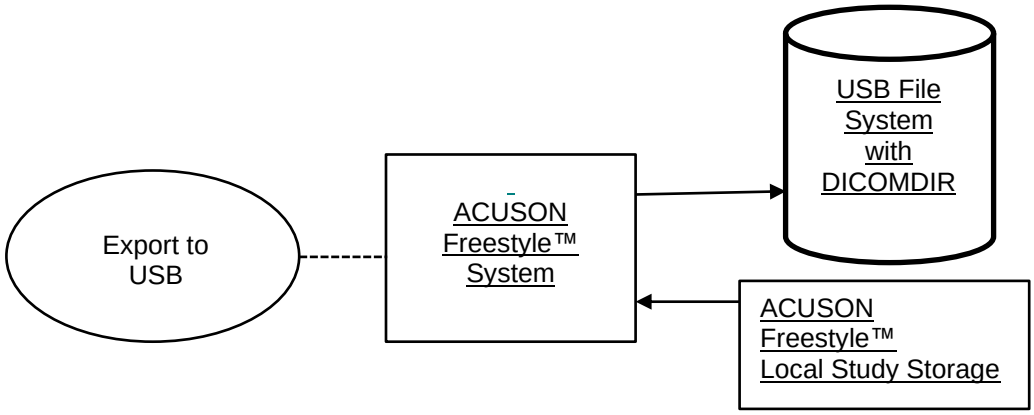
5 MEDIA INTERCHANGE

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

The ACUSON Freestyle™ provides the functionality to export DICOM instances and DICOMDIR to an external USB file system (memory stick). All SOP classes defined in Table 4-1: SOP Classes for Storage AE are supported for the export functionality.

Figure 5-1: Media Application Data Flow Diagram



5.1.2 Functional Definitions of AEs

The ACUSON Freestyle™ is capable of creating a new file set on an external USB file system. A DICOMDIR will be created if one does not exist, or will be updated if it exists.

5.1.3 Sequencing of Real-World Activities

Storage of a DICOM object to an external USB media is triggered from the study list page when one or more studies are selected and the “Export” button is pressed and the export format is configured for DICOM Media or DICOM Media DSF (decompressed single frame).

5.1.4 File Meta Information for Implementation Class and Version

Table 5-1:
Implementation Class – Media Interchange

File Meta Information Version	**0x0001**
Implementation Class UID	**1.3.12.2.1107.5.5.16**

5.2 AE Specifications

5.2.1 Media Storage AE Specification

The ACUSON Freestyle™ system Media Storage AE provides conformance to the following DICOM SOP Classes as an FSC and FSU:

Table 5-2:
Application Profiles, Activities, and Roles for DICOM Exchange Media

Application Profiles Supported	Real World Activity	Role
STD-US-SC-MF-USB	Export study to USB	FSC/FSU

5.2.2 Implementation Identifying Information

Table 5-3:
DICOM Implementation Class and Version for Media Storage AE

Implementation Class UID	1.3.12.2.1107.5.5.16

5.3 Media Storage Application Profile

5.3.1 DICOMDIR Keys

The DICOMDIR file will contain the following attributes for the levels Patient - Study - Series - Image (valid for all Application profiles described in this section).

Table 5-4:
DICOMDIR Keys

Attribute Name	Tag	Type	Notes
File-Set Identification			
File-set ID	(0004,1130)	2	Volume label of media
Specific Character Set	(0008,0005)	1C	
Directory Information			
Offset of the First Directory Record of the Root Directory Entry	(0004,1200)	1	
Offset of the Last Directory Record of the Root Directory Entity	(0004,1202)	1	
File-set Consistency Flag	(0004,1212)	1	0000H
Directory Record Sequence	(0004,1220)	2	
> Offset of the Next Directory Record	(0004,1400)	1C	
> Record In-use flag	(0004,1410)	1C	FFFFH
> Offset of Referenced Lower-Level Directory Entity	(0004,1420)	1C	
> Directory Record Type	(0004,1430)	1C	PATIENT, STUDY, SERIES, IMAGE
> Record Selection Keys	see below		
Patient Keys			**Directory Record Type PATIENT**
Specific Character Set	(0008,0005)	1C	
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	1	
Study Keys			**Directory Record Type STUDY**
Specific Character Set	(0008,0005)	1C	
Study Date	(0008,0020)	1	
Study Time	(0008,0030)	1	
Accession Number	(0008,0050)	2	
Study Description	(0008,1030)	2	
Study Instance UID	(0020,000D)	1C	
Study ID	(0020,0010)	1	Set to 1
Series Keys			**Directory Record Type SERIES**
Specific Character Set	(0008,0005)	1C	
Modality	(0008,0060)	1	
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	1	
Image Keys			**Directory Record Type IMAGE**
Specific Character Set	(0008,0005)	1C	
Referenced File ID	(0004,1500)	1C	Filename on media
Referenced SOP Class UID In File	(0004,1510)	3	
Referenced SOP Instance UID In File	(0004,1511)	3	
Referenced Transfer Syntax UID In File	(0004,1512)	3	

Attribute Name	Tag	Type	Notes
Instance Number	(0020,0013)	1	

5.3.2 Compliance to STD-US-SC-MF-USB

For media conforming to the STD-US-SC-MF-CDR profiles the following SOP Classes and transfer syntaxes will be supported as an FSC.

Table 5-5:
STD-US-SC-MF-USB Supported SOP Classes

IOD	SOP Class UID	Transfer Syntax and UID	FSC	FSR	FSU
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian 1.2.840.10008.1.2.1	Yes	No	No
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG Lossy (Baseline) 1.2.840.10008.1.2.4.50	Yes	No	No
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Lossy (Baseline) 1.2.840.10008.1.2.4.50	Yes	No	No

6 SUPPORT OF CHARACTER SETS

6.1 Character Sets for ACUSON Freestyle™ System

The ACUSON Freestyle™ system supports the ISO 8859 Latin 1 (ISO-IR-100) character set.

7 SECURITY

7.1 Security Profiles

None Supported.

7.2 Association Level Security

None Supported.

7.3 Application Level Security

None Supported.

8 ANNEXES

8.1 IOD Contents

8.1.1 Created SOP Instances

8.1.1.1 US Image IOD Attributes

Module	Attribute	Tag	Type	Notes
Patient Identification	Patient's Name	(0010,0010)	2	User input or MWL
	Patient ID	(0010,0020)	2	User input or MWL
	Other Patient Ids	(0010,1000)	3	From MWL
	Other Patient Names	(0010,1001)	3	From MWL
	Referenced Patient Sequence	(0008,1120))	3	From MWL
Patient Demographic	Patient's Age	(0010,1010)	2	From MWL
	Confidentiality Constraint on Patient Data Description	(0040,3001)	3	From MWL
	Patient's Birth Date	(0010,0030)	2	User Input or MWL
	Patient's Sex	(0010,0040)	2	User input or MWL
	Patient Size	(0010,1020)	3	User input or MWL
	Patient Weight	(0010,1030)	3	User input or MWL
	Patient Address	(0010,1040)	3	From MWL
	Military Rank	(0010,1080)	3	From MWL
	Branch Of Service	(0010,1081)	3	From MWL
	Ethnic Group	(0010,2160)	3	From MWL
	Patient Comments	(0010,4000)	3	From MWL
Patient Study	Admitting Diagnosis Description	(0008,1080)	3	User input or MWL
Patient Medical	Medical Alert	(0010,2000)	3	From MWL
	Allergies	(0010,2110)	3	From MWL
	Smoking Status	(0010,21A0)	3	From MWL
	Additional Patient History	(0010,21B0)	3	From MWL
	Pregnancy Status	(0010,21C0)	3	From MWL
	Last Menstrual Date	(0010,21D0)	3	From MWL
	Special Needs	(0038,0050)	3	From MWL
	Patient State	(0038,0500)	3	From MWL
General Study	Study Instance UID	(0020,000D)	1	Created or from MWL
	Study Date	(0008,0020)	2	Date of study creation
	Study Time	(0008,0030)	2	Time of study creation
	Referring Physician's Name	(0008,0090)	2	From MWL
	Study ID	(0020,0010)	2	Created
	Accession Number	(0008,0050)	2	User input
	Study Description	(0008,1030)	3	From exam type or "unknown"
	Referenced Study Sequence	(0008,1110)	3	From MWL
	Study Comments	(0032,4000)	3	User input
General Series	Modality	(0008,0060)	1	US
	Series Instance UID	(0020,000E)	1	Created

Module	Attribute	Tag	Type	Notes
	Series Number	(0020,0011)	2	Created
	Performing Physician Name	(0008,1050)	3	User input
	Referenced Performed Procedure Step Sequence	(0008,1111)	3	If MPPS is in use
	>Referenced SOP Class UID	(0008,1150)	1	1.2.840.10008.3.1.2.3.3 (MPPS SOP Class)
	>Referenced SOP Instance UID	(0008,1155)	1	MPPS SOP Instance UID
	Operator's Name	(0008,1070)	3	User input or MWL
	Request Attributes Sequence	(0040,0275)	3	From MWL or omitted
	>Requested Procedure ID	(0040,1001)	1C	From MWL
	>Requested Procedure Description	(0032,1060)	3	From MWL
	>Requested Procedure Code Sequence	(0032,1064)	3	From MWL
	>>Code Value	(0008,0100)	1	From MWL
	>> Coding Scheme Designator	(0008,0102)	1	From MWL
	>> Coding Scheme Version	(0008,0103)	1C	From MWL
	>> Code Meaning	(0008,0104)	1	From MWL
	>Scheduled Procedure Step ID	(0040,0009)	1C	From MWL
	>Scheduled Procedure Step Description	(0040,0007)	3	From MWL
	>Scheduled Procedure Code Sequence	(0040,0008)	3	From MWL
	>>Code Value	(0008,0100)	1	From MWL
	>> Coding Scheme Designator	(0008,0102)	1	From MWL
	>> Coding Scheme Version	(0008,0103)	1C	From MWL
	>> Code Meaning	(0008,0104)	1	From MWL
Imaging Service Request	Requesting Physician	(0032,1032)	3	From MWL
	Referring Physician's Name	(0008,0090)	2	From MWL
	Requesting Service	(0032,1033)	3	From MWL
	Issue Date of Imaging Request	(0040,2004)	3	From MWL
	Issue Time of Imaging Request	(0040,2005)	3	From MWL
	Placer Order Number / Imaging Service Request	(0040,2016)	3	From MWL
	Filler Order Number / Imaging Service Request	(0040,2017)	3	From MWL

Module	Attribute	Tag	Type	Notes
	Order Entered By	(0040,2008)	3	From MWL
	Order Enterer Location	(0040,2009)	3	From MWL
	Order Callback Phone Number	(0040,2010)	3	From MWL
	Admission ID	(0038,0010)	3	From MWL
	Imaging Service Request Comments	(0040,2400)	3	From MWL
Requested Procedure	Requested Procedure ID	(0040,1001)	3	From MWL
	Reason For Requested Procedure	(0040,1002)	3	From MWL
	Requested Procedure Comments	(0040,1400)	3	From MWL
	Requested Procedure Code Sequence	(0032,1064)	3	From MWL
	>Code Sequence Macro			
	Requested Procedure Description	(0032,1060)	3	From MWL
	Requested Procedure Priority	(0040,1003)	3	From MWL
	Patient Transport Arrangements	(0040,1004)	3	From MWL
	Confidentiality Code	(0040,1008)	3	From MWL
	Reporting Priority	(0040,1009)	3	From MWL
	Names Of Intended Recipients of Results	(0040,1010)	3	From MWL
Visit Status	Current Patient Location	(0038,0300)	3	From MWL
General Equipment	Manufacturer	(0008,0070)	2	Set to SIEMENS
	Institution Name	(0008,0080)	3	User input or MWL
	Institution Address	(0008,0081)	3	From MWL
	Manufacturer's Model Name	(0008,1090)	3	Set to "ACUSON Freestyle"
	Device Serial Number	(0018,1000)	3	Set to system serial number
	Station Name	(0008,1010)	3	Set to system Application Entity Title
	Software Version	(0018,1020)	3	Set to "VA41x", where x is a letter
General Image	Instance Number	(0020,0013)	2	Image number in study (1-n)
	Patient Orientation	(0020,0020)	2C	Set to zero length
	Content Date	(0008,0023)	2C	Date of image creation
	Content Time	(0008,0033)	2C	Time of image creation
	Image Type	(0008,0008)	3	ORIGINAL\PRIMARY
	Lossy Image Compression	(0028,2110)	1C	Set to 1, if JPEG Baseline transfer syntax used, omitted otherwise
US Image	Transducer Type	(0018,6031)	3	LINEAR or CURVED LINEAR
Image Pixel	Samples Per Pixel	(0028,0002)	1	Set to 3
	Photometric Interpretation	(0028,0004)	1	RGB or YBR_FULL_422
	Rows	(0028,0010)	1	Set to 656
	Columns	(0028,0011)	1	Set to 800

Module	Attribute	Tag	Type	Notes
	Bits Allocated	(0028,0100)	1	Set to 8
	Bits Stored	(0028,0101)	1	Set to 8
	High Bit	(0028,0102)	1	Set to 7
	Pixel Representation	(0028,0103)	1	Set to 0
	Pixel Data	(7FE0,0010)	1	
	Planar Configuration	(0028,0006)	1C	Set to 0
SOP Common	SOP Class UID	(0008,0016)	1	Set to 1.2.840.10008.5.1.4.1.1.6.1
	SOP Instance UID	(0008,0018)	1	Created
	Specific Character Set	(0008,0005)	1C	
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	1	One for each US region displayed
	>Region Location Min x0	(0018,6018)	1	
	>Region Location Min y0	(0018,601A)	1	
	>Region Location Max x1	(0018,601C)	1	
	>Region Location Max y1	(0018,601E)	1	
	>Physical Units X Direction	(0018,6024)	1	Set to 3
	>Physical Units Y Direction	(0018,6026)	1	Set to 3
	>Physical Delta X	(0018,602C)	1	
	>Physical Delta Y	(0018,602E)	1	
	>Region Spatial Format	(0018,6012)	1	Set to 1
	>Region Data Type	(0018,6014)	1	B-Mode set to 1 B Mode, with Color set to 2
	>Region Flags	(0018,6016)	1	Set to 2

8.1.1.2 US Multi-Frame Image IOD Attributes

Module	Attribute	Tag	Type	Notes
Patient Identification	Patient's Name	(0010,0010)	2	User input or MWL
	Patient ID	(0010,0020)	2	User input or MWL
	Other Patient Ids	(0010,1000)	3	From MWL
	Other Patient Names	(0010,1001)	3	From MWL
	Referenced Patient Sequence	(0008,1120))	3	From MWL
Patient Demographic	Patient's Age	(0010,1010)	2	From MWL
	Confidentiality Constraint on Patient Data Description	(0040,3001)	3	From MWL
	Patient's Birth Date	(0010,0030)	2	User Input or MWL

Module	Attribute	Tag	Type	Notes
	Patient's Sex	(0010,0040)	2	User input or MWL
	Patient Size	(0010,1020)	3	User input or MWL
	Patient Weight	(0010,1030)	3	User input or MWL
	Patient Address	(0010,1040)	3	From MWL
	Military Rank	(0010,1080)	3	From MWL
	Branch Of Service	(0010,1081)	3	From MWL
	Ethnic Group	(0010,2160)	3	From MWL
	Patient Comments	(0010,4000)	3	From MWL
Patient Study	Admitting Diagnosis Description	(0008,1080)	3	User input or MWL
Patient Medical	Medical Alert	(0010,2000)	3	From MWL
	Allergies	(0010,2110)	3	From MWL
	Smoking Status	(0010,21A0)	3	From MWL
	Additional Patient History	(0010,21B0)	3	From MWL
	Pregnancy Status	(0010,21C0)	3	From MWL
	Last Menstrual Date	(0010,21D0)	3	From MWL
	Special Needs	(0038,0050)	3	From MWL
	Patient State	(0038,0500)	3	From MWL
General Study	Study Instance UID	(0020,000D)	1	Created or from MWL
	Study Date	(0008,0020)	2	Date of study creation
	Study Time	(0008,0030)	2	Time of study creation
	Referring Physician's Name	(0008,0090)	2	From MWL
	Study ID	(0020,0010)	2	Created
	Accession Number	(0008,0050)	2	User input or MWL
	Study Description	(0008,1030)	3	From exam type or "unknown"
	Referenced Study Sequence	(0008,1110)	3	From MWL
	Study Comments	(0032,4000)	3	User input
General Series	Modality	(0008,0060)	1	US
	Series Instance UID	(0020,000E)	1	Created
	Series Number	(0020,0011)	2	Created
	Performing Physician Name	(0008,1050)	3	User input
	Referenced Performed Procedure Step Sequence	(0008,1111)	3	If MPPS is in use
	>Referenced SOP Class UID	(0008,1150)	1	1.2.840.10008.3.1.2.3.3 (MPPS SOP Class)
	>Referenced SOP Instance UID	(0008,1155)	1	MPPS SOP Instance UID
	Operator's Name	(0008,1070)	3	User input
	Request Attributes Sequence	(0040,0275)	3	From MWL or omitted
	>Requested Procedure ID	(0040,1001)	1C	From MWL

Module	Attribute	Tag	Type	Notes
	>Requested Procedure Description	(0032,1060)	3	From MWL
	>Requested Procedure Code Sequence	(0032,1064)	3	From MWL
	>>Code Value	(0008,0100)	1	From MWL
	>> Coding Scheme Designator	(0008,0102)	1	From MWL
	>> Coding Scheme Version	(0008,0103)	1C	From MWL
	>> Code Meaning	(0008,0104)	1	From MWL
	>Scheduled Procedure Step ID	(0040,0009)	1C	From MWL
	>Scheduled Procedure Step Description	(0040,0007)	3	From MWL
	>Scheduled Procedure Code Sequence	(0040,0008)	3	From MWL
	>>Code Value	(0008,0100)	1	From MWL
	>> Coding Scheme Designator	(0008,0102)	1	From MWL
	>> Coding Scheme Version	(0008,0103)	1C	From MWL
	>> Code Meaning	(0008,0104)	1	From MWL
Imaging Service Request	Requesting Physician	(0032,1032)	3	From MWL
	Referring Physician's Name	(0008,0090)	2	From MWL
	Requesting Service	(0032,1033)	3	From MWL
	Issue Date of Imaging Request	(0040,2004)	3	From MWL
	Issue Time of Imaging Request	(0040,2005)	3	From MWL
	Placer Order Number / Imaging Service Request	(0040,2016)	3	From MWL
	Filler Order Number / Imaging Service Request	(0040,2017)	3	From MWL
	Order Entered By	(0040,2008)	3	From MWL
	Order Enterer Location	(0040,2009)	3	From MWL
	Order Callback Phone Number	(0040,2010)	3	From MWL
	Admission ID	(0038,0010)	3	From MWL
	Imaging Service Request Comments	(0040,2400)	3	From MWL
Requested Procedure	Requested Procedure ID	(0040,1001)	3	From MWL
	Reason For Requested Procedure	(0040,1002)	3	From MWL
	Requested Procedure Comments	(0040,1400)	3	From MWL
	Requested Procedure Code Sequence	(0032,1064)	3	From MWL
	>Code Sequence Macro			

Module	Attribute	Tag	Type	Notes
	Requested Procedure Description	(0032,1060)	3	From MWL
	Requested Procedure Priority	(0040,1003)	3	From MWL
	Patient Transport Arrangements	(0040,1004)	3	From MWL
	Confidentiality Code	(0040,1008)	3	From MWL
	Reporting Priority	(0040,1009)	3	From MWL
	Names Of Intended Recipients of Results	(0040,1010)	3	From MWL
Visit Status	Current Patient Location	(0038,0300)	3	From MWL
General Equipment	Manufacturer	(0008,0070)	2	Set to SIEMENS
	Institution Name	(0008,0080)	3	User input or MWL
	Institution Address	(0008,0081)	3	From MWL
	Manufacturer's Model Name	(0008,1090)	3	Set to "ACUSON Freestyle"
	Device Serial Number	(0018,1000)	3	Set to system serial number
	Station Name	(0008,1010)	3	Set to system Application Entity Title
	Software Version	(0018,1020)	3	Set to "VA41x", where x is a letter
General Image	Instance Number	(0020,0013)	2	Image number in study (1-n)
	Patient Orientation	(0020,0020)	2C	Set to zero length
	Content Date	(0008,0023)	2C	Date of image creation
	Content Time	(0008,0033)	2C	Time of image creation
	Image Type	(0008,0008)	3	ORIGINAL\PRIMARY
	Lossy Image Compression	(0028,2110)	1C	Set to 1, if JPEG Baseline transfer syntax used, omitted otherwise
US Image	Transducer Type	(0018,6031)	3	LINEAR or CURVED LINEAR
Image Pixel	Samples Per Pixel	(0028,0002)	1	Set to 3
	Photometric Interpretation	(0028,0004)	1	RGB or YBR_FULL_422
	Rows	(0028,0010)	1	Set to 656
	Columns	(0028,0011)	1	Set to 800
	Bits Allocated	(0028,0100)	1	Set to 8
	Bits Stored	(0028,0101)	1	Set to 8
	High Bit	(0028,0102)	1	Set to 7
	Pixel Representation	(0028,0103)	1	Set to 0
	Pixel Data	(7FE0,0010)	1	
	Planar Configuration	(0028,0006)	1C	Set to 0
Cine Module	Frame Time	(0018,1063)	1	
Multi-Frame	Number Of Frames	(0028,0008)	1	
	Frame Increment Pointer	(0028,0009)	1	Set to (0018,1063)
SOP Common	SOP Class UID	(0008,0016)	1	Set to 1.2.840.10008.5.1.4.1.1.6.1
	SOP Instance UID	(0008,0018)	1	Created
	Specific Character Set	(0008,0005)	1C	
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	1	One for each US region displayed

Module	Attribute	Tag	Type	Notes
	>Region Location Min x0	(0018,6018)	1	
	>Region Location Min y0	(0018,601A)	1	
	>Region Location Max x1	(0018,601C)	1	
	>Region Location Max y1	(0018,601E)	1	
	>Physical Units X Direction	(0018,6024)	1	Set to 3
	>Physical Units Y Direction	(0018,6026)	1	Set to 3
	>Physical Delta X	(0018,602C)	1	
	>Physical Delta Y	(0018,602E)	1	
	>Region Spatial Format	(0018,6012)	1	Set to 1
	>Region Data Type	(0018,6014)	1	B-Mode set to 1 B Mode, with Color set to 2
	>Region Flags	(0018,6016)	1	Set to 2

8.1.1.3 MPPS: N-CREATE Attributes

The ACUSON Freestyle™ Performed Procedure Step SCU informs the remote SCU when the scheduled procedure step is started by sending the N-CREATE message. The attributes listed in the table below are sent in the N-CREATE message.

Attribute Name	Tag	Required Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	From MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	From MWL or created
>Referenced Study Sequence	(0008,1110)	2	From MWL or zero length
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Accession Number	(0008,0050)	2	From MWL or user input
>Requested Procedure ID	(0040,1001)	2	From MWL or user input
>Requested Procedure Description	(0032,1060)	2	From MWL or zero length
>Scheduled Procedure Step ID	(0040,0009)	2	From MWL or zero length
>Scheduled Procedure Step Description	(0040,0007)	2	From MWL or zero length
>Scheduled Protocol Code Sequence	(0040,0008)	2	From MWL or zero length
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Code Scheme Version	(0008,0103)	3	
>>Code Meaning	(0008,0104)	3	

Attribute Name	Tag	Required Type	Value
Patient's Name	(0010,0010)	2	From MWL or user input
Patient ID	(0010,0020)	2	From MWL or user input or created
Patients Birth Date	(0010,0030)	2	From MWL or user input
Patient's Sex	(0010,0040)	2	From MWL or user input
Referenced Patient Sequence	(0008,1120)	2	From MWL or zero length
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	From SPS ID or created
Performed Station AE Title	(0040,0241)	1	Own AE Title
Performed Station Name	(0040,0242)	2	Own hostname
Performed Location	(0040,0243)	2	From SPS Location or zero length
Performed Procedure Step Start Date	(0040,0244)	1	Created
Performed Procedure Step Start Time	(0040,0245)	1	Created
Performed Procedure Step Status	(0040,0252)	1	IN PROGRESS
Performed Procedure Step Description	(0040,0254)	2	From SPS Description or zero length
Performed Procedure Type Description	(0040,0255)	2	Zero length
Procedure Code Sequence	(0008,1032)	2	From Requested Procedure Code or zero length
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	2	Zero length
Performed Procedure Step End Time	(0040,0251)	2	Zero length
Image Acquisition Results			
Modality	(0008,0060)	1	US
Study ID	(0020,0010)	2	From Requested Procedure ID or created
Performed Protocol Code Sequence	(0040,0260)	2	From Scheduled Action Item Code Sequence or zero length
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	2	
>Performing Physician's Name	(0008,1050)	2C	Zero Length
>Protocol Name	(0018,1030)	1C	Zero Length
>Operator's Name	(0008,1070)	2C	Zero Length
>Series Instance UID	(0020,000E)	1C	Created
>Retrieve AE Title	(0008,0054)	2C	Zero length
>Series Description	(0008,103E)	??	
>Referenced Image Sequence	(0008,1140)	2C	Zero length
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	

Attribute Name	Tag	Required Type	Value
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	2C	Zero Length

8.1.1.4 MPPS: N-SET Attributes

The ACUSON Freestyle™ Performed Procedure Step SCU informs the remote SCP about the performed procedure step and its status. The N-SET message is only sent when the exam is ended with status “COMPLETED” or when the examination could not be completed with status “DISCONTINUED”. The attributes listed in the table below are sent in the N-SET message.

Attribute name	Tag	Required Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	COMPLETED or DISCONTINUED
Performed Procedure Step Description	(0040,0254)	3	From SPS Description
Procedure Code Sequence	(0008,1032)	3	From Requested Procedure Code
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	3	Created
Performed Procedure Step End Time	(0040,0251)	3	Created
Image Acquisition Results			
Performed Action Item Code Sequence	(0040,0260)	3	From Scheduled Action Item Code SQ.
>Code Value	(0008,0100)	1C	
>Code Scheme Designator	(0008,0102)	1C	
>Code Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	3	
>Performing Physician’s Name	(0008,1050)	2C	User input
>Protocol Name	(0018,1030)	1C	Set to “unknown”
>Operator’s Name	(0008,1070)	2C	User input
>Series Instance UID	(0020,000E)	1C	Created
>Retrieve AE Title	(0008,0054)	2C	Zero length
>Referenced Image Sequence	(0008,1140)	2C	Created
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	Zero length