

Siemens Medical Solutions USA, Inc. Ultrasound Division

DICOM Conformance Statement, CV70

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1.0 Purpose

This document describes the conformance to the ACR-NEMA DICOM 3.0 Standard by the Acuson CV70 ultrasound system software version 1.0 from Siemens Medical Solutions USA, Inc. Ultrasound Division. It shall establish the conformance specifications for this system only, and does not apply to other products offered by Siemens Medical Solutions USA, Inc., or its affiliates.

The Acuson CV70 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 SOP classes as defined in Table 2 in this document.

2.0 Scope

The DICOM standard provides a well-defined set of structures and protocols that allow inter-operability to a wide variety of medical imaging devices.

When configured with the DICOM option, the Acuson CV70 system provides support for essential services related to ultrasound scanning and connectivity to DICOM compliant devices. Acuson CV70 system products will not support all features supported by the DICOM standard. This document clearly states the DICOM services and data classes that are supported by the applications included with the Acuson CV70. The intent of this document is to allow users and other vendors who also conform to the DICOM standard to exchange information within the specific context of those elements of the DICOM standard that Acuson CV70 system supports.

This document is written with respect to the adopted portions of the DICOM standard, Revision 3. The following sections of this document follow the outline specified in the DICOM Standard NEMA publication PS3.2.¹

1 Second part of the DICOM standard: NEMA Standards Publication PS 3.2-2001, Digital Imaging and Communications in Medicine (DICOM), Part 2: Conformance

3.0 Definitions

The following table provides a list of terms, their acronyms (if applicable), and their descriptions.

Table 1 Terms, Acronyms, and Descriptions.

Term	Acronym	Description
American College of Radiology - National Electrical Manufacturer's Association	ACR-NEMA	
Application Entity	AE	
Conformance Statement	-	A formal statement associated with a specific implementation of the DICOM Standard. It specifies the Service Classes, Information Objects, Communications Protocols and Media Storage Application Profiles supported by the implementation
DICOM 3.0	-	Digital Imaging and Communications in Medicine, Version 3.0
DICOM Message Service Element	DIMSE	
DICOM Message Service Element, Composite Store	DIMSE C-Store	
Ethernet	-	Network methodology devised in 1976 by DIX (DigitalEquipmentCorporation/Intel/Xerox) which is the most common in practice today. Ethernet is the IEEE standard 802.3
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.
Picture Archiving and Communications Systems	PACS	
Protocol Data Unit	PDU	The PDUs are message formats exchanged between peer entities within a layer. A PDU shall consist of protocol control information and user data.
Request	REQ	
Response	RSP	
Real-World Activity	RWA	That which exists in the real world which pertains to specific area of information processing within the area of interest of the DICOM Standard. Such a Real-World Activity may be represented by one or more computer information metaphors called SOP Classes.

Table 1 Terms, Acronyms, and Descriptions. (Continued)

Term	Acronym	Description
Service Class Provider	SCP	The role played by a DICOM Application Entity (DIMSE-Service-User) which performs operations and invokes notifications on a specific Association.
Service Class User	SCU	The role played by a DICOM Application Entity (DIMSE-Service-User) which performs operations and invokes notifications on a specific Association.
Service-Object Pairs	SOP	The union of a specific set of DIMSE Services and one related Information Object Definition which completely defines a precise context for communication.
Unique identifier	UID	

4.0 Implementation Model

Acuson CV70 system users can store images and other data directly on the Acuson CV70 system hard disk. Images can be exported to a DICOM archive server or workstation or printer on a network. In the following sections, Acuson CV70 system Real World Activities are indicated by “Real World Activity” name while “CV70 AE” indicates the invoked Application Entity. Similarly, the activities associated with service providers are indicated as “Real World Service Activity.”

4.1 Application Data Flow Diagram

Figure 4.1 illustrates the Acuson CV70 system's Application Entity (AE), which is shown in the box. Relationships between users 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.

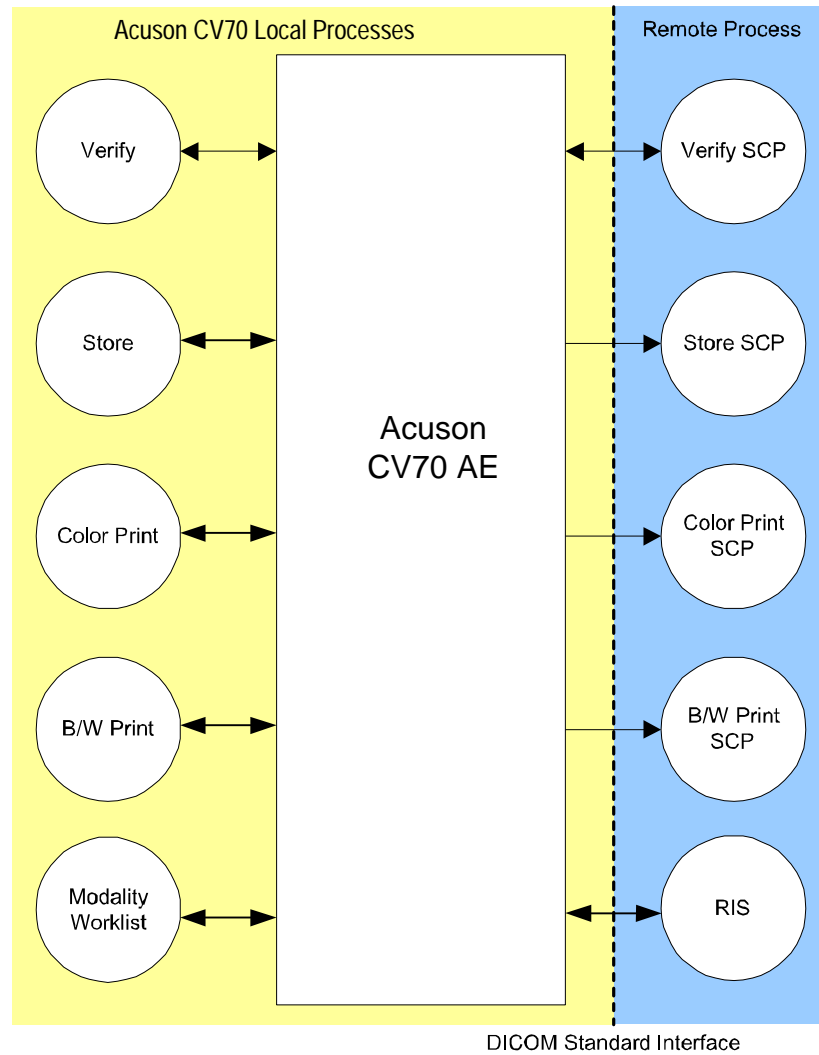


Figure 1 Implementation Model.

4.1.1 Verification

Verification is a part of the DICOM configuration located on the 'DICOM' page of the System Presets. Verification can be used to send a DICOM Verification request to a remote Application Entity (AE) and listen for a response.

When used as a diagnostic tool, Verification returns the following messages to the user:

- If the verification succeeds: "DICOM - Successfully contacted system"
- If the verification fails: "DICOM - Unable to communicate with system"

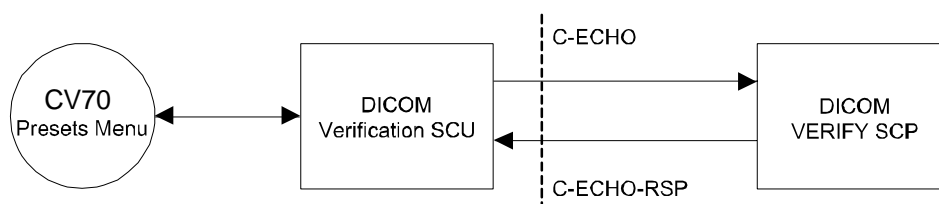


Figure 2 Verification Model.

4.1.2 DICOM Store

When requested Acuson CV70 sends images to the preconfigured DICOM Storage server.

DICOM Store can be seen as two sub-operations:

- queueing images for transfer
- transferring images to the storage server.

Queueing images for transfer:

CV70 can be configured to automatically queue up images for transfer as they are being created. "AutoStore to DICOM" option in DICOM presets has to be set for this.

Alternatively, user can select exams or individual images and manually queue them up from Review mode.

Transfer of images to the storage server:

Further, once images are queued they may be immediately transferred or delayed until the end of study using the transfer storage configuration.

CV70 supports two storage configurations: "Store At End of Exam" and "Store During Exam".

If the storage configuration is set to “Store At End of Exam”, images queued to destination devices will be transferred when the user selects “Close Study” or “New Patient”.

If the storage configuration is set to “Store During Exam”, images are transferred to destination devices immediately after they are queued.

For both “Store At End of Exam” and “Store During Exam” settings, image transfer will be delayed if the CV70 is busy performing another DICOM Command (Store/Print/Echo).

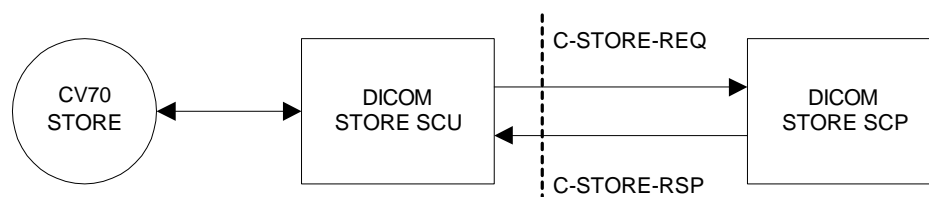


Figure 3 Store Model.

4.1.3 DICOM Print

Acuson CV70 system is capable of grayscale (B/W) and color printing.

When requested, single frame images will be printed to a pre-configured DICOM network printer.

DICOM Print can be seen as two sub-operations:

- paging images for transfer
- transferring pages to printer

Paging images for transfer:

Acuson CV70 can be configured to automatically queue up images to be printed on B/W Printer and/or Color printer as they are being created.

Alternatively, user can select exams or individual images and manually queue them up from Review mode for print.

Every image queued up is added into a page in the respective printer layout (DICOM B/W Printer Layout or DICOM Color Printer Layout).

Transfer of pages to the Printer:

Further, pages may be immediately transferred to the printer or delayed till the end of study based on the transfer configuration.

Acuson CV70 supports two configurations: “Print At End of Exam” and “Print when page full”.

If the configuration is set to “Print At End of Exam,” all pages are transferred to the destination DICOM printer as a batch when the user ends the exam.

If the configuration is set to “Print when page full”, a page is transferred to the destination DICOM printer as soon as it becomes full.

For both “Print At End of Exam” and “Print when page full” settings, page transfer will be delayed if the CV70 is busy performing another DICOM Command (Store/Print/Echo).

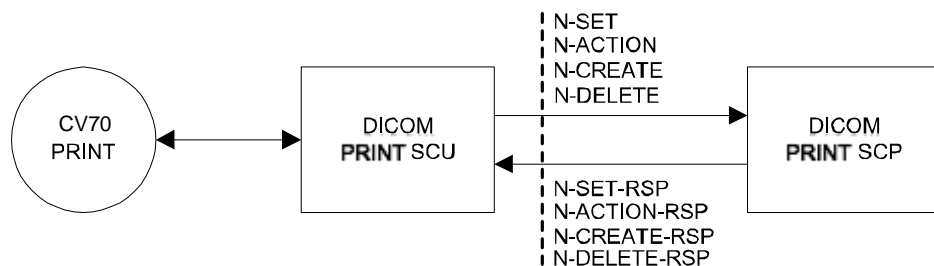


Figure 4 Print Model.

4.1.4 Patient Registration using Worklist

Patient registration can be automated by using the 'Worklist' Real World Activity. Pressing the 'New Patient' key on the keyboard initiates the patient data registration process and closes the previous active study. Pressing the 'Worklist' option on the patient data display screen invokes the Worklist query screen. (It can also be initiated from the Study screen).

Initiating the 'Search' button will attempt to find all matching patients using the information from the Worklist Query screen. 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. ID and Accession number will be exact match only. If no matches are found, a message will be presented to the operator indicating so. If more than one matching patient is found, a pick list of patient exams will be presented to the user to select from. Each of the fields will be sortable in ascending and descending order. The list will be limited to a number of preset entries. If more than this number of matching records are found in the query, the search will terminate and the user will be notified. The search list criteria will contain:

- Patient name
- Patient ID
- Accession number
- Exam start date/time range

- Requested Procedure ID
- US/All modality
- Scheduled station AE title

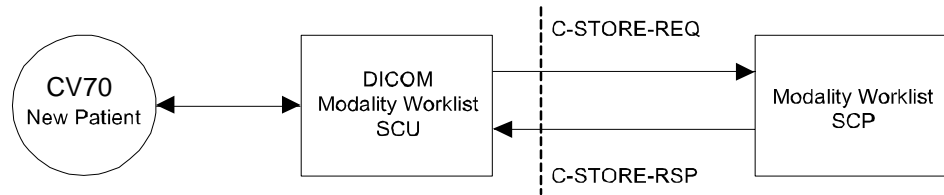


Figure 5 Modality Worklist Model

The following data fields in Modality Worklist Screen are initially populated from the New Patient Screen and are used for query:

Attribute Name	Tag
Patient's Full Name	(0010,0010)
Patient ID	(0010,0020)
Accession Number	(0008,0050)

The following data fields will be populated on the worklist screen for each return:

Attribute Name	Tag
Patient's Full Name	(0010,0010)
Patient ID	(0010,0020)
Accession Number	(0008,0050)
Exam Start Date/Time	(0040,0002), (0040,0003)
Scheduled Procedure Step Sequence	(0040,0100)*
>Scheduled Procedure Step Description	(0040,0007)
>Scheduled Protocol Code Sequence	(0040,0008)
>>Code Value	(0008,0100)
Requested Procedure Description	(0032,1060)
Exam Type	(0008,1030)**

Attribute Name	Tag
*<code1>, ..., <codeN>: <sched1>, ..., <schedn> where: code<i> = Sequence item code value(0008,0100) for a given sequence or value multiplicity sched<i> = Scheduled procedure step(0040,0007) for a given sequence or value multiplicity **if a value exists for (0008,1030). Otherwise, Exam Type is set to value of Scheduled procedure step(0040,0007). If (0040,0007) is also empty, Exam Type is set to Requested procedure Description (0032,1060) if it exists.	

The user will have the option to select a patient exam, or cancel the operation. Selection of a patient from the list will cause all demographic information for that patient to be loaded in to the patient data fields.

The following data fields will be populated on the patient data screen:

Attribute Name	Tag
Patient Name (first,middle,last)	(0010,0010)
Patient ID	(0010,0020)
Accession number	(0008,0050)
Exam start date/time	(0040,0002), (0040,0003)
DOB	(0010,0030)
Sex	(0010,0040)
Weight	(0010,1030)
Height	(0010,1020)
Physician	(0008,0090)
Indication	(0080,1080)
LMP	(0010,21D0)

Once a Worklist query is initiated, a “Querying DICOM Worklist Server” dialog will be presented to the user. The user will only have one option, “CANCEL,” which will abort the query operation.

4.1.5 Removable Media Storage

The CV70 can perform DICOM operations to its standard on-board 120mm CD disk drive.

The CV70 performs only the File Set Creator Role for CD disks:

File Set Creator (FSC): a DICOM non-conformant CD media is created when the user saves studies in DICOM format to the CD. Only the DICOM image files are provided on the CD, no DICOMDIR file is created.

4.2 AE Functional Definition

4.2.1 Verification Real-World Activities

The Acuson CV70 application entity performs Verification Service Class as an SCU and SCP allowing the operator to verify the ability of an application on a remote device to receive DICOM messages and allowing the operator of a remote DICOM device to verify the Acuson CV70 system's ability to receive DICOM messages. (C-ECHO DIMSE)

4.2.2 Store Real-World Activities

The Acuson CV70 Application Entity (AE) performs all of the functions to transmit ultrasound images and associated data to network servers and / or workstations. The Acuson CV70 AE supports the Ultrasound Image, Ultrasound Multi-Frame Image, Ultrasound Image (Retired), Ultrasound Multi-Frame (Retired) and Secondary Capture storage SOP classes as an SCU.

The Acuson CV70 AE initiates an association for C-STORE Requests to store providers when the user invokes "DICOM Store". The association may be used to store multiple image and clips and is closed when no images or clips are available to be stored to the remote device for five seconds.

4.2.3 Print Real-World Activities

The Acuson CV70 AE provides all aspects of the Print Management SCU. The Acuson CV70 AE initiates an association to the printer when the user invokes "DICOM Print". The association may be used to print multiple pages and is closed when no pages are available to be printed to the remote device for five seconds.

4.3 Sequencing of Real-World Activities

Remote processing of Real World Activity SCP services which the Acuson CV70 requests as an SCU occur in sequential fashion based on the order the user has requested. This initiation occurs with the "Store" for image store operations, "B/W Print," "Color Print" for image printing operations.

Note: In some cases, the order may not be as described above.

4.4 Modality Worklist Real-World Activities

The Acuson CV70 AE supports the DICOM Basic Worklist Management Service as an SCU. The AE initiates an association to the active Worklist server when a Worklist query is selected (via the "Worklist" button). The association is closed upon the completion of each query. A preset number of maximum matching results is accepted, at which point, the Acuson CV70 AE issues a C-FIND-CANCEL request.

4.5 Removable Media Storage Real-World Activities

The Acuson CV70 AE provides partial implementation of DICOM Store to CD. The Acuson CV70 AE selects one or more studies and exports the same to CD. CV70 creates a DICOM File Format Image File for every image and clip in each of the selected studies.

DICOMDIR file is not created along with the files.

5.0 AE Specifications

The following specifications apply to the Acuson CV70 AE as depicted in Figure 4.1.

5.1 Acuson CV70 AE Specification

The Acuson CV70 AE provides conformance to the following DICOM Service SOP Classes as an SCU. Additionally, the Acuson CV70 AE provides conformance to Verification SOP Class as SCP.

Table 2 Supported SOP Classes

Service SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1
Printer SOP Class	1.2.840.10008.5.1.1.16
Modality Worklist Information Model C- FIND	1.2.840.10008.5.1.4.31

5.1.1 Association Establishment Policies

5.1.1.1 General

The Acuson CV70 system utilizes TCP/IP. The Maximum Length PDU negotiation is included in all association establishment requests. The maximum length PDU offered for an association initiated by Acuson CV70 is:

- Maximum PDU Offered: 28672

5.1.1.2 Association Establishment Order

CV70 initiates each C-Store Request one at a time, one for each transfer request being processed.

Image format on CV70 can be set to one of “Automatic”, “Old Ultrasound” or “Secondary Capture”.

In “Automatic” setting, CV70 negotiates Ultrasound Image, Ultrasound Multi-Frame Image, Ultrasound Image (Retired), Ultrasound Multi-Frame (Retired) Image and Secondary Capture Image sequentially.

In “Old Ultrasound” setting, CV70 negotiates Ultrasound Image (Retired), Ultrasound Multi-Frame (Retired) Image and Secondary Capture Image sequentially.

In “Secondary Capture” setting, CV70 negotiates only Secondary Capture Image.

5.1.1.3 Asynchronous Nature

All associations use the default synchronous mode of operation. Asynchronous Operations Window negotiations are not supported on the Acuson CV70 system.

5.1.1.4 Implementation Identifying Information

- Implementation Class UID: “1.3.12.2.1107.5.5.5” (See below).
- Implementation Version Name: “MergeCOM3_310”

Siemens has provided registration for all Siemens Medical Solutions Groups. This unique Class UID is defined as:

“1.3.12.2.1107.5.5.product”

Where the interpretation is:

1. = International Standards Organization (ISO)
3. = International branch of ISO
- 12.2.1107.5. = Assigned to Siemens-UB MED
5. = Ultrasound Modality (SMS-UG)

Product = 5 for Acuson CV70 DICOM Implementation

5.1.2 Association Initiation by Real-World Activities

5.1.2.1 Real World Activity – Verification

The Acuson CV70 is capable of supporting Verification service class as SCU or SCP. Verification can be initiated as a singular event from the Systems Presets menu to any configured SCP that supports Verification.

Proposed Presentation Contexts – Verification

The Acuson CV70 will propose Presentation contexts as shown in table 3.

Table 3 Verification Presentation Context.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
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
Verification	1.2.840.10008.1.1	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU/ SCP	None
Verification	1.2.840.10008.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU/ SCP	None

5.1.2.2 Real World Activity – Store

CV70 facilitates user to store images as they are being created or later in review mode.

Queueing images during acquisition:

“Autostore to DICOM” option in Storage presets has to be set. One or more of “Store/Print1”, “Store/Print2”, “Clip Store” keys on the control panel can be configured for Store (Disk Store, D.Store, Clip capture). When the user presses one of the configured keys, image is acquired, stored on the hard disk and queued up to be transferred to the storage server.

Queueing images in Review mode:

User can select individual images from open or closed studies, or one or more closed studies and queue them up for Storage. DICOM Store button is available in Review screen for this operation.

Transfer of images to the storage server:

Further, once images are queued they may be immediately transferred or delayed till the end of study using the transfer storage configuration.

CV70 supports two storage configurations: “Store At End of Exam” and “Store During Exam”.

If the storage configuration is set to “Store At End of Exam”, all images queued to destination devices will be transferred as a batch when the user selects “Close Study” or “New Patient”.

If the storage configuration is set to “Store During Exam”, images are transferred to destination devices immediately after they are created.

For both “Store At End of Exam” and “Store During Exam” settings, image transfer will be delayed if the CV70 is busy performing another DICOM Command (Store/Print/Echo).

Associated Real World Activities

When images are transferred from the hard disk to a DICOM Store SCP, the system establishes an association between the CV70 AE and the configured DICOM device (i.e. Network Archive Server, Workstation Server). The association may be used to store multiple image and clips and is closed when no images or clips are available to be stored to the remote device for five seconds.

Proposed Presentation Context

The following Presentation Contexts are presented to the SCP in an A-Associate request for DIMSE C-STORE storage services. The storage services utilize C-STORE services, as defined by the DICOM Standard. Table 4 represents all “Store” Real World Activities.

Table 4 Store Presentation Context.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Ultrasound Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 4 Store Presentation Context. (Continued)

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

The Acuson CV70 system always acts as an SCU and is the client in a client-server model.

SOP Specific Conformance to Storage Service SOP Classes

The Store REAL WORLD ACTIVITY provides standard extended conformance as an SCU for the following standard Storage Service Class SOP:

Table 5 Supported SOP Classes.

Service SOP Class Name	SOP Class UID	Conformance Level
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Standard Extended
Ultrasound Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Standard Extended
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Standard Extended
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Standard Extended
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Standard Extended

This is accomplished using the DIMSE C-STORE Service. The SCU issues a service request with a SOP instance that meets the requirements of the desired ultrasound IOD.

The following table denotes the attributes included in the Ultrasound Image Object as implemented on the Acuson CV70. Attributes not listed are not used.

Table 6 US Image and US RETIRED Image IOD Attributes used.

Module	Attribute	Tag	Notes
Patient	Patient's Name	(0010,0010)	CV70 Patient Data Screen – Last Name, First & Middle fields.
	Patient ID	(0010,0020)	CV70 Patient Data Screen – ID field. Default is today's date & time (e.g., 03_04_2003_17_54_43 = Apr. 3, 2003 at 5:54:43 PM).
	Patient's Birth Date	(0010,0030)	CV70 Patient Data Screen – DOB field. Default is a zero length attribute.
	Patient's Sex	(0010,0040)	CV70 Patient Data Screen – Gender field. M = male F = female. O= Other Default is a zero length attribute.
	Patient's Size	(0010,1020)	CV70 Patient Data Screen – Height field.
	Patient's Weight	(0010,1030)	CV70 Patient Data Screen – Weight field.
	Admitting Diagnosis Description	(0008,1080)	CV70 Patient Data Screen – Indication field.
General Study	Study Instance UID	(0020,000D)	
	Study Date	(0008,0020)	Date the exam started.
	Study Time	(0008,0030)	Time the exam started.
	Referring Physician's Name	(0008,0090)	CV70 Patient Data Screen – Physician field.
	Study ID	(0020,0010)	
	Accession Number	(0008,0050)	CV70 Patient Data Screen – Accession # field.
General Series	Modality	(0008,0060)	Set to "US."
	Series Instance UID	(0020,000E)	
	Series Number	(0020,0011)	Series Number is always 1.
General Equipment	Manufacturer	(0008,0070)	Set to "Siemens Ultrasound."
	Institution Name	(0008,0080)	CV70 System Presets – Organization Name field.
General Image	Instance Number	(0020,0013)	Image number in study (1 – n)
Image Pixel	Lossy Image Compression	(0028,2110)	"00"
	Samples per Pixel	(0028,0002)	RGB = 3.

Table 6 US Image and US RETIRED Image IOD Attributes used. (Continued)

Module	Attribute	Tag	Notes
	Rows	(0028,0010)	Set to 480 for NTSC; 547 for PAL. For post-processed images and screen captures, this value maybe up to 600.
	Columns	(0028,0011)	Set to 640 for NTSC; 692 for PAL. For post-processed images and screen captures, this value may be up to 800.
	Bits Allocated	(0028,0100)	Set to 8.
	Bits Stored	(0028,0101)	Set to 8.
	High Bit	(0028,0102)	Set to 7.
	Pixel Data	(7FE0, 0010)	
	Planar Configuration	(0028,0006)	Color-by-pixel. Always set to 0.
	Photometric Interpretation	(0028,0004)	RGB
	Pixel Representation	(0028,0103)	0000H = unsigned integer.
US Image	Image Type	(0008,0008)	Sent as a 0 length attribute. The CV70 never fills in a value for Image Type.
SOP Common	SOP Class UID	(0008,0016)	Always US Image – 1.2.840.10008.5.1.4.1.1.6.1 or 1.2.840.10008.5.1.4.1.1.6
	SOP Instance UID	(0008,0018)	
Image Plane	Pixel Spacing	(0028,0030)	Pixel Spacing information is only sent for single, full screen, 2D image types (2D image types are B-mode, B-mode with color, B-mode with power).
Region Calibration ^(a)	Region Spatial Format	(0018,6012)	B-Mode (Tissue or Color) = 0001H M-Mode (Tissue or Color) = 0002H Spectral (CW/PW) Doppler = 0003H
	Region Data Type	(0018,6014)	B-Mode, M-Mode = 0001H (Tissue) Spectral Doppler = 0004H (CW Spectral Doppler) Spectral Doppler = 0003H (PW Spectral Doppler)

Table 6 US Image and US RETIRED Image IOD Attributes used. (Continued)

Module	Attribute	Tag	Notes
	Region Flags	(0018,6016)	1st Bit (LSB) = 1 (All images acquired are transparent) 2nd Bit = 1 (All images acquired are automatically scaled) 3rd Bit = 1 for frequency scale 3rd Bit = 0 for velocity scale. The value of the 3rd bit is undefined for any mode other than Doppler. The value for 3rd bit is undefined if both frequency and velocity scales are selected on the Doppler image. 4th Bit is Reserved and value is always 0
	Region Location Min X0	(0018,6018)	
	Region Location Min Y0	(0018,601A)	
	Region Location Max X1	(0018,601C)	
	Region Location Max Y1	(0018,601E)	
	Physical Units X direction	(0018,6024)	B-Mode (Tissue or Color) = 0003H (cm) M-Mode (Tissue or Color) = 0004H (seconds) Spectral (CW/PW) Doppler = 0004H (seconds)
	Physical Unitx Y direction	(0018,6026)	B-Mode (Tissue or Color) = 0003H (cm) M-Mode (Tissue or Color) = 0003H (cm) Spectral (CW/PW) Doppler = 0007H (cm/sec)
	Physical Delta X	(0018,602C)	
	Physical Delta Y	(0018,602E)	
	Reference Pixel X0	(0018,6020)	Attribute only sent for Spectral Doppler Regions
	Reference Pixel Y0	(0018,6022)	Attribute only sent for Spectral Doppler Regions
	Reference Pixel Physical Value X	(0018,6028)	Attribute only sent for Spectral Doppler Regions When provided, value is always 0.
	Reference Pixel Physical Value Y	(0018,602A)	Attribute only sent for Spectral Doppler Regions When provided, value is always 0.

(a) Region Calibration is provided only for 2D (B-Mode), M-Mode and Spectral Doppler Regions.

Region Calibration is not supported on Ultrasound RETIRED images, Screen Captures and post-processed images.

Region Calibration is not supported for M-Mode or Spectral Doppler still images taken from Live Imaging.

Table 7 USMF Image and USMF RETIRED Image IOD Attributes used.

Module	Attribute	Tag	Notes
Patient	Patient's Name	(0010,0010)	CV70 Patient Data Screen – Last Name, First & Middle fields.
	Patient ID	(0010,0020)	CV70 Patient Data Screen – ID field. Default is today's date & time (e.g., 03_04_2003_17_54_43 = Apr. 3, 2003 at 5:54:43 PM).
	Patient's Birth Date	(0010,0030)	CV70 Patient Data Screen – DOB field. Default is a zero length attribute.
	Patient's Sex	(0010,0040)	CV70 Patient Data Screen – Gender field. M = male F = female. O= Other Default is a zero length attribute.
	Patient's Size	(0010,1020)	CV70 Patient Data Screen – Height field.
	Patient's Weight	(0010,1030)	CV70 Patient Data Screen – weight field.
	Admitting Diagnosis Description	(0008,1080)	CV70 Patient Data Screen – Indication field.
General Study	Study Instance UID	(0020,000D)	
	Study Date	(0008,0020)	Date the exam started.
	Study Time	(0008,0030)	Time the exam started.
	Referring Physician's Name	(0008,0090)	CV70 Patient Data Screen – Physician field.
	Study ID	(0020,0010)	
	Accession Number	(0008,0050)	CV70 Patient Data Screen – Accession # field.
General Series	Series Instance UID	(0020,000E)	
	Series Number	(0020,0011)	Series Number is always 1.
General Equipment	Manufacturer	(0008,0070)	Set to "Siemens Ultrasound."
	Institution Name	(0008,0080)	CV70 System Presets – Organization Name field.
General Image	Instance Number	(0020,0013)	Image number in study (1 – n)
Image Pixel	Samples per Pixel	(0028,0002)	RGB = 3.

Table 7 USMF Image and USMF RETIRED Image IOD Attributes used. (Continued)

Module	Attribute	Tag	Notes
	Rows	(0028,0010)	Set to 480 for NTSC; 547 for PAL.
	Columns	(0028,0011)	Set to 640 for NTSC; 692 for PAL.
	Bits Allocated	(0028,0100)	Set to 8.
	Bits Stored	(0028,0101)	Set to 8.
	High Bit	(0028,0102)	Set to 7.
	Pixel Data	(7FE0, 0010)	
	Lossy Image Compression	(0028,2110)	Set to "01."
	Planar Configuration	(0028,0006)	Color-by-pixel. Always set to 0
	Photometric Interpretation	(0028,0004)	YBR_FULL_422 or RGB if sent uncompressed.
	Pixel Representation	(0028,0103)	0000H = unsigned integer.
US Image	Image Type	(0008,0008)	Sent as a 0 length attribute. The CV70 never fills in a value for Image Type
	Frame Increment Pointer	(0028,0009)	0x00181063H
SOP Common	SOP Class UID	(0008,0016)	Always US MF – 1.2.840.10008.5.1.4.1.1.3.1 or 1.2.840.10008.5.1.4.1.1.3
	SOP Instance UID	(0008,0018)	
Image Plane	Pixel Spacing	(0028,0030)	Pixel Spacing information is only sent for single, full screen, 2D image types (2D image types are B-Mode, B-Mode Color, B-Mode with power).
Cine	Frame Time	(0018,1063)	
Multi-Frame	Number of Frames	(0028,0008)	
Region Calibration ^(a)	Region Spatial Format	(0018,6012)	B-Mode (Tissue or Color) = 0001H M-Mode (Tissue or Color) = 0002H Spectral (CW/PW) Doppler = 0003H
	Region Data Type	(0018,6014)	B-Mode, M-Mode = 0001H (Tissue) Spectral Doppler = 0004H (CW Spectral Doppler) Spectral Doppler = 0003H (PW Spectral Doppler)

Table 7 USMF Image and USMF RETIRED Image IOD Attributes used. (Continued)

Module	Attribute	Tag	Notes
	Region Flags	(0018,6016)	1st Bit (LSB) = 1 (All images acquired are transparent) 2nd Bit = 1 (All images acquired are automatically scaled) 3rd Bit = 1 for frequency scale 3rd Bit = 0 for velocity scale. The value of the 3rd bit is undefined for any mode other than Doppler. The value for 3rd bit is undefined if both frequency and velocity scales are selected on the Doppler image. 4th Bit is Reserved and value is always 0
	Region Location Min X0	(0018,6018)	
	Region Location Min Y0	(0018,601A)	
	Region Location Max X1	(0018,601C)	
	Region Location Max Y1	(0018,601E)	
	Physical Units X direction	(0018,6024)	B-Mode (Tissue or Color) = 0003H (cm) M-Mode (Tissue or Color) = 0004H (seconds) Spectral (CW/PW) Doppler = 0004H (seconds)
	Physical Unitx Y direction	(0018,6026)	B-Mode (Tissue or Color) = 0003H (cm) M-Mode (Tissue or Color) = 0003H (cm) Spectral (CW/PW) Doppler = 0007H (cm/sec)
	Physical Delta X	(0018,602C)	
	Physical Delta Y	(0018,602E)	
	Reference Pixel X0	(0018,6020)	Attribute only sent for Spectral Doppler Regions
	Reference Pixel Y0	(0018,6022)	Attribute only sent for Spectral Doppler Regions
	Reference Pixel Physical Value X	(0018,6028)	Attribute only sent for Spectral Doppler Regions When provided, value is always 0.
	Reference Pixel Physical Value Y	(0018,602A)	Attribute only sent for Spectral Doppler Regions When provided, value is always 0.

(a) Region Calibration is provided only for 2D (B-Mode), M-Mode and Spectral Doppler Regions.

Region Calibration is not supported on Ultrasound Multiframe RETIRED images.

Region Calibration is not supported for M-Mode or Spectral Doppler still images taken from Live Imaging.

Table 8 SC Image IOD Attributes used.

Module	Attribute	Tag	Notes
Patient	Patient's Name	(0010,0010)	CV70 Patient Data Screen – Last Name, First & Middle fields.
	Patient ID	(0010,0020)	CV70 Patient Data Screen – ID field. Default is today's date & time (e.g., 03_04_2003_17_54_43 = Apr. 3, 2003 at 5:54:43 PM).
	Patient's Birth Date	(0010,0030)	CV70 Patient Data Screen – DOB field. Default is a zero length attribute.
	Patient's Sex	(0010,0040)	CV70 Patient Data Screen – Gender field. M = male F = female. O= Other Default is a zero length attribute.
	Patient's Size	(0010,1020)	CV70 Patient Data Screen – Height field.
	Patient's Weight	(0010,1030)	CV70 Patient Data Screen – Weight field.
	Admitting Diagnosis Description	(0008,1080)	CV70 Patient Data Screen – Indication field.
General Study	Study Instance UID	(0020,000D)	
	Study Date	(0008,0020)	Date the exam started.
	Study Time	(0008,0030)	Time the exam started.
	Referring Physician's Name	(0008,0090)	CV70 Patient Data Screen – Physician field.
	Study ID	(0020,0010)	
	Accession Number	(0008,0050)	CV70 Patient Data Screen – Accession # field.
General Series	Series Instance UID	(0020,000E)	
	Series Number	(0020,0011)	Series Number is always 1.
SC Image Equipment Module	Modality	(0008,0060)	Set to "US."
	Conversion Type	(0008,0064)	Set to "WSD"
General Image	Instance Number	(0020,0013)	Image number in study (1 – n)
Image Pixel	Samples per Pixel	(0028,0002)	RGB = 3.

Module	Attribute	Tag	Notes
	Rows	(0028,0010)	Set to 480 for NTSC; 547 for PAL. For post-processed images and screen captures, this value maybe up to 600.
	Columns	(0028,0011)	Set to 640 for NTSC; 692 for PAL. For post-processed images and screen captures, this value may be up to 800.
	Bits Allocated	(0028,0100)	Set to 8.
	Bits Stored	(0028,0101)	Set to 8.
	High Bit	(0028,0102)	Set to 7.
	Pixel Data	(7FE0, 0010)	
	Planar Configuration	(0028,0006)	Color-by-pixel. Always set to 0
	Photometric Interpretation	(0028,0004)	RGB
	Pixel Representation	(0028,0103)	0000H = unsigned integer.
SOP Common	SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.7
	SOP Instance UID	(0008,0018)	

Error Handling

The following table indicates the response status codes, that are handled by the Acuson CV70 AE, which a SCP may return following the SCU's C-STORE-RSP command. Only those status codes that indicate some form of error condition are presented to the user.

A successful C-STORE operation will allow the Acuson CV70 AE to continue to the next action desired by the user.

Table 9 C-STORE Status Responses.

Service Status	Further Meaning	Protocol Codes	Related Fields
Refused	Out of resources.	A7xxH	None
Error	Data set does not match SOP Class. Cannot understand.	A9xxH CxxxH	None
Warning	Coercion of data Elements. Data set does not match SOP Class. Elements discarded.	B000H B007H B006H	None
Success		0000H	None

If the C-STORE operation is not successful, the image(s) are spooled on the Acuson CV70 hard drive. One additional attempt is made to store the image(s). If this attempt fails, the user must press "Retry All Jobs" on the Store or Print Status page, or restart the system to complete the C-STORE operation.

All image storage on the Acuson CV70 system hard drive is temporary in nature. The oldest transferred exams are automatically deleted to make room for new exams, on a need to basis. If an attempt is made to store images on a full Acuson CV70 system hard drive, the system will attempt to delete the oldest transferred exam data. If no deleteable data exists, a "DISK FULL" message is displayed on the Acuson CV70 system display. The user must then delete exams not transferred in order to temporarily store additional images.

5.1.2.3 Real World Activity - Print

Acuson CV70 facilitates user to print images as they are being created or later in review mode.

Paging images during acquisition

One or more of "Store/Print1" and "Store/Print2" keys on the control panel can be configured for Print (DICOM B/W Print and/or DICOM Color Print). When the user presses one of the configured keys on the control panel, the image is acquired, stored on the hard disk and placed in a page under the respective printer layout (DICOM B/W Printer Layout or DICOM Color Printer Layout).

Paging images in Review mode

User can select individual images from open/closed studies, or one or more entire closed studies and queue them up for print. DICOM B/W Printer and DICOM Color Printer buttons are available in Review screen for this operation. When a study is selected for print, all single-frame images belonging to the study will be paged.

Transfer of pages to the Printer

Pages may be immediately transferred or delayed till the end of study using the transfer configuration.

CV70 supports two configurations: "Print At End of Exam" and "Print when page full".

If the configuration is set to "Print At End of Exam", all pages queued to destination devices will be transferred as a batch when the user selects "Close Study" or "New Patient".

If the configuration is set to "Print when page full", a page is transferred to destination devices immediately after it is full.

For both “Print At End of Exam”, and “Print when page full” settings, image transfer will be delayed if the CV70 is busy performing another DICOM Command (Store/Print/Echo).

Associated Real World Activities

An association is established when the user initiates a “B/W Print” or “Color Print” operation from the Review screen. Individual images or entire exams can be transferred to the selected DICOM Print device. The association is opened when the first image of each selected exam is transferred and closed when the last image transfer is complete. An association is also opened after a network outage, or if images are queued to be printed, or when the system is powered-on and the images are queued to be printed.

Proposed Presentation Context to a Grayscale Print Server

Table 10 Grayscale Print Presentation Context.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.2	SCU	None

SOP Specific Conformance to Basic Grayscale Print Management Meta SOP Class

The Acuson CV70 AE provides standard conformance of the Grayscale Meta SOP classes as an SCU. Specifically, with respect to the Basic Grayscale Print Management Meta SOP Class this means conformance to the underlying SOP classes:

Table 11 Conformance to Grayscale Print Meta SOP Class.

SOP Class Name	SOP Class UID	Conformance Level
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Standard
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Standard
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Standard
Printer SOP Class	1.2.840.10008.5.1.1.16	Standard

All mandatory elements of these classes are supported.

Specific Conformance to Basic Film Session SOP Class

DICOM specified usage - M = Mandatory; U = User Option

Table 12 Supported DIMSE Services for Basic Film Session SOP Class.

Name	Usage	Description
N-Create	M	Creates the Film Session.
N-Set	U	Not used.
N-Delete	U	Deletes the Film Session.
N-Action	U	Not used.

Table 13 Attributes set for Basic Film Session

Attribute Name	Tag	Usage	Range	Description
Print Priority	(2000,0020)	U	HIGH, MED,LOW	
Number of Copies	(2000,0010)	U		
Medium Type	(2000,0030)	U	Paper, Blue Film, Clear Film, Transparency, Current	

SOP Specific Conformance to Basic Film Box SOP Class

Table 14 Supported DIMSE Services for Basic Film Box SOP Class.

Name	Usage	Description
N-Create	M	Creates the Film Box.
N-Set	U	Not used.
N-Delete	U	Deletes the Film Box. Issued after each film is printed.
N-Action	M	PRINT. Sent after each Film Box is filled, and at the end of the exam to force a print of partially filled Film Box.

Table 15 Optional Attributes set for the Basic Film Box SOP Class.

Attribute Name	Tag	Usage	Range	Description
Image Display Format	(2010,0010)		STANDARD\ X,Y	Where X, Y can be configured/ selected as 1*1, 1*2, 2*2, 2*3, 3*2, 3*3, 3*5, 4*5, 4*6, 5*6
Film Orientation	(2010,0040)	U	PORTRAIT LANDSCAPE	Range may be limited by print server/printer.
Film Size ID	(2010,0050)	U	8INX10IN 8.5INX11IN 10INX12IN 10INX14IN 11INX14IN 11INX17IN 14INX17IN 24CMX24CM 24CMX30CM A3 A4	Range may be limited by print server/printer.
Magnification Type	(2010,0060)	U	REPLICATE BILINEAR CUBIC NONE	Used.
Min. Density	(2010,0120)	U	1-349	Used - printer specific
Max Density	(2010,0130)	U	1-349	Used - printer specific
Configuration Information	(2010,0150)	U	Limited by Print server/printer.	Not Used.
Smoothing Type	(2010,0080)	U	Values depend on Printer	Used.
Border Density	(2010,0100)	U	BLACK WHITE	
Empty Image Density	(2010,0110)	U	BLACK WHITE	
Trim	(2010,0140)	U	YES NO	Used.

SOP Specific Conformance to Basic Grayscale Image Box SOP Class

Table 16 Supported DIMSE Services for the Basic Grayscale Image Box SOP.

Name	Usage	Description
N-Set	M	The SCP for each potential image of the film box creates an image box instance. Only those instances, which actually contain images, will be updated with the N-SET message.

Table 17 Optional Attributes set for the Basic Grayscale Image Box SOP Class.

Attribute Name	Tag	Range	Description
Image Position	(2020,0010)	1-30	Value according to Image Display Format
Polarity	(2020,0020)	NORMAL, REVERSE	Intensity mapping between display and print
Magnification Type	(2010,0060)	REPLICATE, BILINEAR, CUBIC, NONE	Used. Note that Magnification Type is always set to the same value as FILM BOX
Smoothing Type	(2010,0080)	Values depend on Printer	Used. Note that Smoothing Type is always set to the same value as FILM BOX

Table 18 Supported DIMSE Services for the Printer SOP.

Name	Usage	Description
N-Event-Report	M	Ignored and not handled.
N-Get	U	May be issued by this device at any time to get printer status.

Table 19 Supported Printer SOP Class Elements

Attribute Name	Tag	Usage	Range	Description
Printer Status	(2110,0010)	U	WARNING FAILURE	During a "Failure" the Print job will be displayed as "Failed, awaiting retry"
Printer Status Information	(2110,0020)	U	Vendor specific	Reported to user if printer status = WARNING or FAILURE.
Printer Name	(2110,0030)	U		Used (not reported to user)
Manufacturer		U		Used (not reported to user)
Manufacturers Model Name	(0008,1090)	U		Used (not reported to user)

Attribute Name	Tag	Usage	Range	Description
Device Serial Number	(0018,1000)	U		Used (not reported to user)
Software Versions	(0018,1020)	U		Used (not reported to user)
Date of Last Calibration	(0018,1200)	U		Used (not reported to user)
Time of Last Calibration	(0018,1201)	U		Used (not reported to user)

Proposed Presentation Context to a Color Print Server

Table 20 Color Print Server Presentation Context.

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.2	SCU	None

SOP Specific Conformance to Basic Color Print Management Meta SOP Class

The Acuson CV70 Print AE provides standard conformance to the color printing Meta SOP classes as an SCU. Specifically, with respect to the Basic Color Print Management Meta SOP Class this means conformance to the underlying SOP classes:

Table 21 Conformance to Color Print Meta SOP Class.

SOP Class Name	SOP Class UID	Conformance Level
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Standard
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Standard
Basic Color Image Box SOP Class	1.2.840.10008.5.1.1.4.1	Standard
Printer SOP Class	1.2.840.10008.5.1.1.16	Standard

SOP Specific Conformance to Basic Color Image Box SOP Class

The Basic Color Print Management Meta SOP Class makes identical use of the *Basic Film Session SOP Class*, *Basic Film Box SOP Class* and *Printer SOP Class* elements, which have been previously described, for grayscale image printing. Therefore, these will not be described again in this section

on color printing. However, it should be noted that certain attributes, such as Medium Type which is defined in the Basic Film Session SOP Class, are highly likely to require printer/print server specific media.

Table 22 Supported DIMSE Services for the Basic Color Image Box SOP Class.

Name	Usage	Description
N-Set	M	The SCP for each potential image of the film box creates an image box instance. Only those instances, which actually contain images, will be updated with the N-SET message.

Table 23 Optional attributes set for the Basic Color Image Box SOP Class.

Name	Attribute	Range	Description
Planar Configuration	(0028,0006)	Color-by-plane	Red plane, Green plane, Blue plane.

The Printer SOP Class behavior is identical to that used for grayscale printing.

Error Handling

The Acuson CV70 Print AE supports the following error codes and reports failures to the user.

Table 24 Supported Error Codes for Printer Classes.

Service Status	Further Meaning	Protocol Codes
Success	Film accepted for Printing	0000H
Warning	Film accepted for Printing, one or more settings ignored.	107H,116H,B600H,B601H ,B602H,B603H,B604H,B605H ,B609H,B60AH
Failure	Printing not successful	C602H, C603H, C613H

If the print operation is not successful, the image(s) are spooled on the Acuson CV70 hard drive. One additional attempt is made to print the image(s). If this attempt fails, the user must press “Retry All Jobs” on the Store or Print Status page, or restart the system to complete the print operation.

5.1.2.4 Real World Activity - Worklist

A separate Network association is established by the AE for each Worklist query operation, with only one active query at a time. The association is closed at completion of the query.

Table 25 Worklist Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian	1.2.840.10008.1.2.1	SCU	None
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

The Acuson CV70 will always act as an SCU and be the client in a client-server model.

SOP Specific Conformance to Modality Worklist Service SOP Classes

The Worklist AE provides conformance to the following DICOM Service SOP Classes as an SCU all at a standard extended level of conformance:

Table 26 Supported SOP Classes

Supported SOP Class Name	SOP Class UID	Conformance Level
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Standard Extended

The following table provides the list of attributes requested in the Modality Worklist Query.

Table 27 Modality Worklist Information Model Attributes

Attribute Name	Tag
Patient Name (first,middle,last)	(0010,0010)*
Patient ID	(0010,0020)*
Accession number	(0008,0050)*
Requested Procedure ID	(0040,1001)*
US/All Modality	(0008,0060)*
Scheduled Station AE Title	(0040,0001)*
Exam start date/time	(0040,0002), (0040,0003)*
DOB	(0010,0030)
Sex	(0010,0040)
Weight	(0010,1030)
Height	(0010,1020)
Physician	(0008,0090)
Indication	(0080,1080)
Scheduled Procedure Step Sequence	(0040,0100)
>Scheduled Procedure Step Description	(0040,0007)
>Scheduled Action Item Sequence	(0040,0008)
>> Code Value	(0008,0100)

Attribute Name	Tag
Requested Procedure Description	(0032,1060)
LMP	(0010,21D0)
Study UID	(0020,000D)
Series UID	(0020,000E)
*Indicates parameter may be populated for query.	

5.1.2.5 Error Handling

The user is informed of an error if the server is detected but an association cannot be formed.

6.0 Removable Media Interchange Specifications

This implementation supports 120mm CD-R medium. It is a non-conformant implementation. It only conforms to specific portions of DICOM 3.0 Parts 10, 11 and 12.

6.1 Supported Application Profiles

Acuson CV70 provides non-standard conformance to the following four of the Ultrasound Application Profiles.

Table 28 Application Profiles, Real-World Activities, and Roles

Supported AP	Real-World Activity	Roles	SC Option
STD-US-ID-SF-CDR	Create CD-R	FSC	Interchange
STD-US-ID-MF-CDR	Create CD-R	FSC	Interchange
STD-US-SC-SF-CDR	Create CD-R	FSC	Interchange
STD-US-SC-MF-CDR	Create CD-R	FSC	Interchange

6.2 Supported SOP Classes

6.2.1 Supported SOP Classes and Transfer Syntaxes

This implementation provides non-standard conformance to the following DICOM 3.0 SOP Classes. DICOM Directory Storage is not implemented.

Table 29 Proposed Transfer Syntaxes for Media Interchange

Service SOP Class Name	SOP Class UID	Transfer Syntax Name	Transfer Syntax UID List
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50

The following table denotes the attributes included in the Ultrasound Image Object as implemented on the Acuson CV70 in addition to the attributes listed in Table 6.

Table 30 US Image Attributes Used (Refer Table 6 for additional attributes used)

Attribute Name	Tag	Notes
File Preamble	No Tag or Length fields	All bytes are set to 00H
DICOM Prefix	No Tag or Length fields	Set to DICOM Prefix "DICM"
Group length	(0002,0000)	
File Meta Information Version	(0002,0001)	Always set to 0001H
Media Storage SOP Class UID	(0002,0002)	Always Ultrasound Image 1.2.840.10008.5.1.4.1.1.6.1
Media Storage SOP Instance UID	(0002,0003)	
Transfer Syntax UID	(0002,0010)	Always Explicit VR Little Endian 1.2.840.10008.1.2.1

The following table denotes the attributes included in the Ultrasound Multi-Frame Image Object as implemented on the Acuson CV70 in addition to the attributes listed in Table 7.

Table 31 USMF Image Attributes Used (Refer Table 7 for additional attributes used)

Attribute	Tag	Notes
File Preamble	No Tag or Length fields	All bytes are set to 0
DICOM Prefix	No Tag or Length fields	Set to "DICM"
Group length	(0002,0000)	
File Meta Information Version	(0002,0001)	Always set to 0001H
Media Storage SOP Class UID	(0002,0002)	Always Ultrasound Multi-Frame Image 1.2.840.10008.5.1.4.1.1.3.1
Media Storage SOP Instance UID	(0002,0003)	
Transfer Syntax UID	(0002,0010)	Always Lossy JPEG 8 Bit Compression 1.2.840.10008.1.2.4.50

6.2.2 Physical Storage Media and Media Formats

The physical storage media supported is 120mm CD-R Medium.

7.0 Communication Profiles

All Acuson CV70 system application entities utilize the DICOM 3.0 TCP/IP communication support as defined in PS3.8 (Part 8) of the DICOM 3.0 Standard.

7.1 TCP/IP Stack Supported

Each process inherits its TCP/IP stack from the Acuson CV70's operating systems TCP/IP stack. Port number 104 is used as the default for DICOM communication with the Acuson CV70.

7.1.1 Physical Media Supported

Standard representations of IEEE 802.3 10BaseT/100BaseT ("twisted pair") is supported

7.1.2 Chapter Extensions/Specializations/Privatizations

No private elements are used by the Acuson CV70 AE.

Pixel Spacing information is only sent for single, full screen, and 2D image types (B-mode, B-mode with color, and B-mode with power).

8.0 Configuration

Acuson CV70 Networking and DICOM parameters can be configured through the Acuson CV70 System Presets Menu screens. The following configuration is supported:

- General system
- Network (local and remote)
- DICOM Store
- DICOM Print
- Modality Worklist

8.1 General System Configuration

The following system parameter can be configured via the Acuson CV70 System Presets Basic Menu screens. This parameter is mapped to DICOM image attributes:

- Hospital Name

8.1.1 Hospital Name

The user can enter the organization (i.e. hospital, clinic, etc.) as a text string in the Organization Name field of the System Presets - Basic menu. The Organization Name field is transferred to DICOM devices as Institution Name - DICOM data element (0008, 0080).

8.2 DICOM Network Configuration

DICOM and networking parameters can be configured for both the local CV70 device and remote DICOM service class providers through the System Presets DICOM Network Menu.

8.2.1 Local

The Acuson CV70 local network parameters are configurable. The following network parameters can be configured for Acuson CV70 device:

- Host Name
- IP address
- Subnet IP mask
- Default Gateway

- Port Number
- DICOM Application Entity Title

8.2.2 Remote

Multiple DICOM service class providers can be configured through the system presets. The following network parameters can be configured for each remote device:

- DICOM Device Application Entity Title
- IP address
- Port Number

8.3 DICOM Print Configuration

For each DICOM Print server, the following data is configurable by the user using the System Presets DICOM Print User Interface. The user can change each element at any time during the operation of the Acuson CV70. The effect of changing parameters of the DICOM Print server will be seen at the next created film sheet. The current film sheet is not affected by changing these parameters.

Table 32 User-configurable printer parameters.



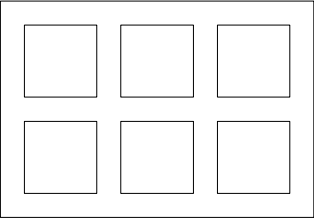
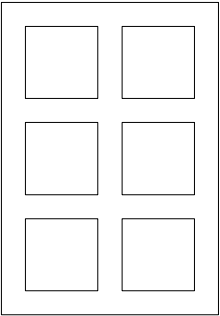
Parameter	Description
Printer Type:	Color or Black and White - depends on printer
Film Size	Select the size of the film - 8x10 inches, 8.5x11 inches, 10x12 inches, 10x14 inches, 11x14 inches, 11x17 inches, 14x17 inches, 24x24 centimeters, 24x30 centimeters, A3, or A4.
Film Orientation	Select from Portrait: <div style="text-align: center; margin: 10px 0;">  </div> or Landscape: <div style="text-align: center; margin: 10px 0;">  </div>

Table 32 User-configurable printer parameters. (Continued)

Parameter	Description
Display Format	<p>You must supply the number of rows and columns of images on the printed sheet.</p> <p>For example, a 6 on 1 print with Landscape mode should have 3 columns and 2 rows:</p>  <p>A 6 on 1 with Portrait mode would have 2 columns and 3 rows:</p> 
Print Priority	HIGH, MEDIUM or LOW
Medium Type	PAPER, CLEAR FILM, BLUE FILM, TRANSPARENCY or CURRENT (to use the currently loaded media)
Film Destination	MAGAZINE, PROCESSOR or CURRENT
Max. Density	Used to define the Black value - printer specific
Min. Density	Used to define the White value - printer specific
Smoothing Type	Printer specific value
Border Density	BLACK or WHITE
Empty Image Density	BLACK or WHITE
Trim	YES/NO to having a border around each image
Polarity	Normal/reverse. Normal means black is printed as black. Reverse means the grayscale is inverted so that black comes out as white and white as black.
Configuration Information:	Printer Specific values

8.4 DICOM Worklist Configuration

Remote DICOM Worklist Service Class Providers are configured through the DICOM - Worklist page of the System Presets. The following parameters can be configured for each Worklist server:

- AET (Application Entity Title)
- IP Address
- Port number
- Alias
- 'Active' listbox - makes the current selected device the active Worklist server.

Additionally, these can be specified over all servers:

- Maximum number of returns per query.
- Streamlined search

8.5 External Equipment Configuration

The Acuson CV70 user can configure control panel hard key to output device through the System Presets - Customize Keys. Print images are acquired and sent to the assigned device when the user presses the associated key. The following key assignments are supported:

- **Clip Store** – This key can be assigned to Multi-frame Store Capture, Cine Store or Disk Store
- **Print/Store 1** – This key can be assigned to any configured DICOM Printer, DICOM Store or OEM printer device.
- **Print/Store 2** – This key can be assigned to any configured DICOM Printer, DICOM Store or OEM printer device.

8.6 Support of Extended Character Sets

The "ISO-IR 100" Latin Alphabet 1 Extended character set is supported by the Acuson CV70 system.