	REV	REVISION STATUS	
REVISION STATUS	A	Initial Release DVS (Digital Video Streaming) Module with DICOM 3 1/2" and 5 1/4" MO Media output.	SEE PIMS FOR EFFECTIVITY,

DOCUMENT TITLE

HDI 5000 with DVS Media Device DICOM Media Conformance Statement

DOCUMENT PURPOSE:

The purpose of this document is to specify the DICOM Media conformance of the ATL HDI 5000 Software Version 177.09 and DVS Media Device, Software Version 104431

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0 INTRODUCTION

This DICOM Conformance Statement is for the DICOM Media Storage Implementation in the DVS (Digital Video Streaming) module as used on an appropriately configured ATL HDI 5000.

1 IMPLEMENTATION MODEL: DVS Media Device

The DVS MEDIA Device creates, updates and/or reads either 3 ½" (90mm) MOD and 5 ¼" (130mm) media, depending on configuration, with various DICOM SOP instances. It can process Ultrasound Store, Ultrasound Multiframe Store images.

1.1 Application Data Flow Diagram: DVS Media Device Real-World relationship

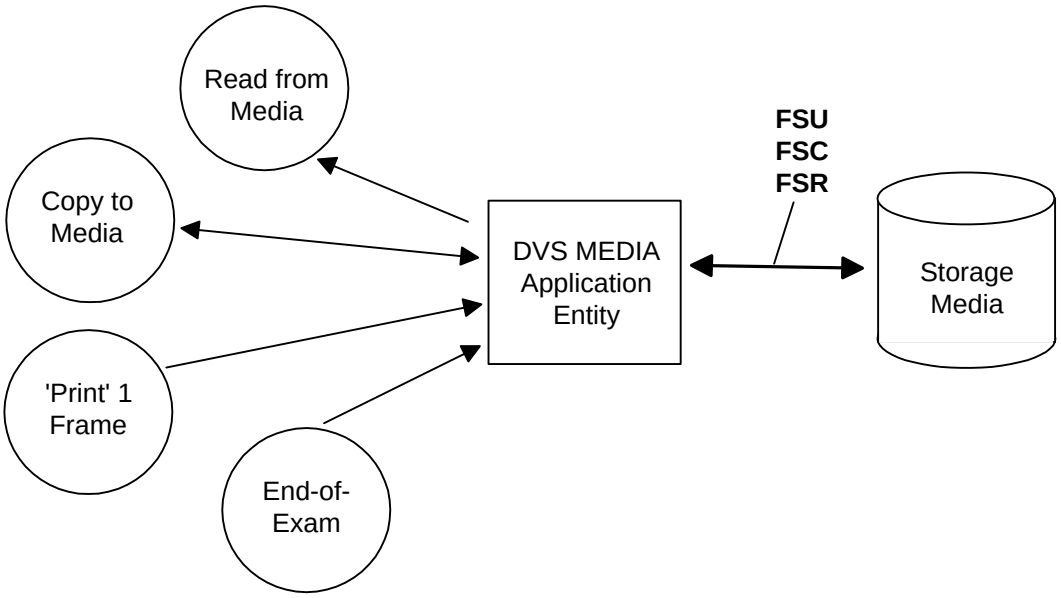

Figure 1-1 Real-World Relationships to Application Data Flow

The DVS Media application reads from Removable Media acting as an **FSR** to read in SOP instances as selected by the user when the "Copy to H.D." command is used. The DVS Media application will only display files that match the supported SOP Classes in the supported Application Profiles.

The DVS Media application creates a DICOMDIR on Removable Media by acting as an **FSC** to create a new DICOM File-set onto Removable Media. Using the "Copy to Media" command, the "Print" key when assigned to "Store to Media" or when "End-of -Exam Archive" is invoked.

It initializes the DICOM File-set and writes the specified SOP instances onto the media. The SOP instances written will be limited to instances that match the criteria of one of the supported Application Profiles listed in Table 2.2-1.

The DVS Media application updates DICOM Media by writing various SOP instances to Removable Media by acting as an **FSU** by writing and updating the DICOMDIR file on that media to reflect additions to or deletions of various SOP instances to / from the media. The DICOMDIR file will contain Directory Records of PATIENT, STUDY, SERIES and IMAGE corresponding to the Information Objects in the Fileset.

1.2 Functional Definition of Application Entities

This device has only one Application Entity: the Media Update Application.

The DVS Media Application can perform these functions:

- it can **initialize** a piece of media, writing a new DICOM File-set onto the media;
- it can **update** a piece of media by adding new SOP instances to an already existing DICOM File-set;
- it can **display** a directory listing of the File-set on a piece of media;
- it can **copy** SOP instances from the media onto local storage.

1.2.1 Media Roles and Operations Supported

The DVS Media application shall act as **File-set Updater**, **File-set Creator** and **File-set Reader**. The following table lists the operations supported by these roles. FSC and FSU functions are identical except for FSC will be used when no DICOMDIR exists.

1.3 Sequencing Requirements

The updating function can only be performed on a piece of media that has already had a DICOM File-set created. There are no other sequencing requirements.

1.4 File Meta Information Options

Implementation Class UID = 1.2.840.113663.1298
Implementation Version Name = None

2 AE SPECIFICATIONS

2.1 Media Update Specification

The Media Update application provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in Table 2.2-1. This application has the ability to support the DICOM Media Roles as listed in the previous section. Therefore it is capable of being the **FS-Creator** when the media is un-initialized, **FS-Updater** when the media already has a DICOMDIR file and is having filesets added to or deleted from it, and as **FS-Reader** when copying from removable media to system hard drive, or displaying media contents. The media may be of any format that the Windows NT 4 Operation System supports.

Table 2.1-1 Application Profiles, Activities, and Roles for Media Update

Application Profiles Supported	Real World Activity	Role	SC Option
90mm (3 1/2") media STD-US-ID-MF-MOD540, 130mm (5 1/4") media for 2.6GB and 5.2GB MOD media	Copy to H.D.	FSR	Interchange
	Copy to Media, Print key(*), End of Exam when media is un-initialized	FSC	Interchange
	Copy to Media, Print key(*), End of Exam when media is initialized	FSU	Interchange

(*) When the print key is configured to store to removable media.

The DVS Media Application will query the user before initializing media when a File-set is found on media and an initialize operation has been requested.

2.1.1 Real-World Activities for this Application Entity

2.1.1.1 Real-World Activity: Copy to Hard Drive

The DVS Media Application acts as an **FSR** using the Interchange option when requested to copy data from removable media to the system hard drive.

2.1.1.1.1 Application Profiles for FSR: Copy to Hard Drive.

The list of Application Profiles that invoke this AE is on Table 2.1-1, Application Profiles, Activities, and Roles for Media Update. Only the SOP Classes and Transfer syntaxes listed in Table 2.2-1, Abstract and Transfer Syntaxes will be supported for FS-Reader functions. Initial release will only guarantee successful reading of ATL DVS generated media on the supported media types.

2.1.1.2 Real-World Activity: Copy to Media, Print Key, and End of Exam

The DVS Media application acts as an **FSC / FSU** using the Interchange option if the installed media has **not / has** been initialized and any of the following commands are issued:

- "Copy to Media" command
- The Print key is pressed for a single image when "Store to Media" is the selected destination
- When "End of Exam" is invoked with "Archive" selected.

The DVS Media application as **FSC** will take the user provided list of SOP instances (which may be empty), and write those SOP Instances to the media and create a corresponding DICOMDIR.

If the selection list is empty, the **FSC** action results in the creation of an empty File-set.

The DVS Media application as **FSU** will copy new SOP Instances onto the media or delete images based on user selection.

2.1.1.2.1 Application Profiles for FSC / FSU: Copy to Media, Print Key, and End of Exam

For the list of Application Profiles that invoke this AE, see Table 2.2-1, Application Profiles, Activities, and Roles for Media Update. Only the SOP Classes and Transfer syntaxes listed in Table 2.2-1, Abstract and Transfer Syntaxes will be supported.

2.2 Abstract and Transfer Syntaxes

The following table contains the standard DICOM IOD, SOP Class UID and Transfer Syntaxes supported by the DVS Media application.

Application Profiles in the classes listed in Table 2.1-1, STD-US, support the appropriate Information Object Definitions (IOD) and Transfer Syntaxes for the Media Storage SOP Class in the following table.

FS-Updater and FS-Creator roles will use the RGB or YBR_FULL_422 Photometric Interpretation **only** for all images. In the role of FS-Reader, DVS will support **only** these Photometric Interpretations.

Table 2.2-1 Abstract and Transfer Syntaxes

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Ultrasound Image Store	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Baseline	1.2.840.10008.1.2.4.50
Ultrasound Multiframe Image Store	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		JPEG Baseline	1.2.840.10008.1.2.4.50
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1

2.3 Standard SOP Specific Conformance to Ultrasound Image Storage SOP Class

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

Ultrasound Image Storage Modules Used

Module Name	Usage	Description
Patient	M	Used
General Study	M	Used
Patient Study	U	Used
General Series	M	Used
Frame of Reference	U	Not used
US Frame of Reference	C	Not used
General Equipment	M	Used
General Image	M	Used
Image Pixel	M	Used
Palette Color Lookup Table	C	Not used
Contrast/bolus	C	Not used
Cine	C	Used (in Multiframe SOP only)
Multi-frame	C	Used (in Multiframe SOP only)
US Region Calibration	U	Not used
US Image	M	Used
Overlay Plane	U	Not used
VOI LUT	U	Used
SOP Common	M	Used

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

Patient Module

Attribute Name	Tag	Type	Value	Description
Patient Name	0010, 0010	2	Name	Patient Name Long Last and First name fields are supported, up to 64 characters each.
Patient ID	0010, 0020	2	String	Patient's ID Limited to 18 characters
Patient's Birth Date	0010, 0030	2	Date String	Patient's Birth Date
Patient's Sex	0010, 0040	2	M, F, or Null	Patient's Sex

General Study Module

Attribute Name	Tag	Type	Value	Description
Study Instance UID	0020, 000D	1	UID	Unique ID for the Study
Study Date	0008, 0020	2	YYYYMMDD	
Study Time	0008, 0030	2	HHMMSS	
Referring Physician's Name	0008, 0090	2	Short String	Mapped from "Referring" field. Limited to 32 characters.

Study ID	0020, 0010	2		ID Number for the Study
Accession Number	0008, 0050	2	Short String	Limited to 16 characters
Study Description	0008, 1030	3	String	Mapped from "Study Title" field. Limited to 32 characters.
Name of Physician(s) Reading Study	0008, 1060	3	Name	Mapped from "Reading Physician" field. Limited to 32 characters.

Patient Study Module

Attribute Name	Tag	Type	Value	Description
Admitting Diagnosis Description	0008, 1080	3	String	Mapped from "Indications" field. Limited to 64 characters.
Patient's Age	0010, 1010	3	Tag sent only if entered in Patient Data Entry	Patient's age
Patient's Size	0010, 1020	3	Tag sent only if entered in Patient Data Entry	Patient's height in metric units.
Patient's Weight	0010, 1030	3	Tag sent only if entered in Patient Data Entry	Patient's weight in metric units.
Additional Patient's History	0010, 21B0	3	String	Mapped from "Previous Surgeries" field. Limited to 255 characters.

General Series Module

Attribute Name	Tag	Type	Value	Description
Modality	0008, 0060	1	US	Always Ultrasound
Series Instance UID	0020, 000E	1	UID	Unique ID for the Series
Series Number	0020, 0011	2	N	Number of the series
Series Date	0008, 0021	3	YYYYMMDD	
Series Time	0008, 0031	3	HHMMSS	
Protocol Name	0018, 1030	3	String	User defined description under which the Series was performed.
Series Description	0008, 103E	3	String	Series description
Operator's Name	0008, 1070	3	Name	Mapped from "Sonographer" field

Frame of Reference

Attribute Name	Tag	Type	Value	Description
Not supported				

US Frame of Reference

Attribute Name	Tag	Type	Value	Description
Not supported				

General Equipment Module

Attribute Name	Tag	Type	Value	Description
Manufacturer	0008, 0070	2	ATL	
Institution Name	0008, 0080	3	String, as entered in the "Setup" screen.	Hospital / Institution name
Manufacturer's Model Name	0008, 1090	3	HDI5000/DVS	System Type and DVS option
Software Versions	0018, 1020	3	String	DVS software version

General Image Module

Attribute Name	Tag	Type	Value	Description
Instance Number	0020, 0013	2	Integer String	A number that identifies the image
Image Date	0008, 0023	2C	YYYYMMDD	
Image Time	0008, 0033	2C	HHMMSS	

Image Type	0008, 0008	3	ORIGINAL\SECONDARY\\	U/S Image attribute description. Term 3 and Term 4 are left blank.
Image Comments	0020, 4000	3	String	Contains Clip, Frame, or View Name
Lossy Image Compression	0028, 2110	3	00 – No lossy compression 01 – Lossy Compression	Indicate use of compression
Lossy Image Compression Ratio	0028, 2112	3	Decimal String	Lossy compression ratio applied to the image

Image Pixel Module

Attribute Name	Tag	Type	Value	Description
Samples per Pixel	0028, 0002	1	Always 3	No Monochrome2
Photometric Interpretation	0028, 0004	1	Either RGB Or YBR_FULL_422	RGB in color-by-pixel only not in color-by-plane
Rows	0028, 0010	1	232, 472, 480	Quad, Half, Full Image height in pixels
Columns	0028, 0011	1	320, 320, 640	Quad, Half, Full Image width in pixels
Bits Allocated	0028, 0100	1	8	
Bits Stored	0028, 0101	1	8	
High Bit	0028, 0102	1	7	
Pixel Representation	0028, 0103	1	0x0000	Unsigned Integer
Pixel Data	7FE0, 0010	1		Interpreted as sequence start for JPEG images.
Planar Configuration	0028, 0006	1C	0x0000	
Pixel Aspect Ratio	0028, 0034	1C	1\1	

Palette Color Lookup Table Module

Attribute Name	Tag	Type	Value	Description
Not supported				

Contrast/Bolus Module

Attribute Name	Tag	Type	Value	Description
Not supported				

Cine Module

Attribute Name	Tag	Type	Value	Description
Frame Time	0018, 1063	1C	Decimal String	Nominal time per frame in milliseconds
Recommended Display Frame Rate	0008, 2144	3	Integer String	Recommended display in frames per second

Multi-frame Module

Attribute Name	Tag	Type	Value	Description
Number of Frames	0028, 0008	1	Integer String	Number of frames in this cineloop
Frame Increment Pointer	0028, 0009	1C	Contains tag: 0018, 1063	This tag represents Sequencing by Frame Time

US Region Calibration Module

Attribute Name	Tag	Type	Value	Description
Not supported				

US Image Module

Attribute Name	Tag	Type	Value	Description
Samples Per Pixel	0028, 0002	1	Always 3	No Monochrome2
Photometric	0028, 0004	1	Either RGB	RGB in color-by-pixel only

Interpretation			Or YBR_FULL_422	not in color-by-plane
Bits Allocated	0028, 0100	1	8	
Bits Stored	0028, 0101	1	8	
High Bit	0028, 0102	1	7	
Planar Configuration	0028, 0006	1C	0x0000	
Pixel Representation	0028, 0103	1	0x0000	Constant
Frame Increment Pointer	0028, 0009	1C	Contains tag: (0018,1063)	This tag represents Sequencing by Frame Time
Image Type	0008, 0008	2	ORIGINAL\SECONDARY\\	U/S Image attribute description. Term 3 and Term 4 are left blank.
Lossy Image Compression	0028, 2110	1C	00 – No lossy compression 01 – Lossy Compression	
Number of Stages	0008, 2124	2C	N	Number of stages
Number of Views in Stage	0008, 212A	2C	N	Number of views
Stage Name	0008, 2120	3	String	Mapped from “Series Title”
Stage Number	0008, 2122	3	N	Series number
View Number	0008, 2128	3	N	Contains the image number
Number of Event Timers	0008, 2129	3	Integer String Tag sent only if timers used	Number of event timers used during acquisition
Event Elapsed Time(s)	0008, 2130	3	Decimal String Tag sent only if timers used	Array of time values in milliseconds
Event Timer Name(s)	0008, 2132	3	LO Tag sent only if timers used	Name that identifies the event timers
Heart Rate	0018, 1088	3	Decimal String	Beats per minute

Overlay Plane Module

Attribute Name	Tag	Type	Value	Description
NOT SUPPORTED				

VOI LUT Module

Attribute Name	Tag	Type	Value	Description
Window Center	0028, 1050	3	128	For Monochrome ONLY
Window Width	0028, 1051	1C	256	Must be present if tag 0028, 1050 is used.

SOP Common Module

Attribute Name	Tag	Type	Value	Description
SOP Class UID	0008, 0016	1	1.2.840.10008.5.1.4.1.1.3.1 or 1.2.840.10008.5.1.4.1.1.6.1	SOP Class UID (same as 0002,0002) Media Storage SOP Class UID
SOP Instance UID	0008, 0018	1	1.2.840.113663.1298.pc.sn.3.n.yyyymmdd.1hhmmss	SOP Instance UID (same as 0002,0003) Media Storage SOP Instance UID

3 AUGMENTED AND PRIVATE PROFILES

3.1 Augmented Profiles

None.

3.2 Private Profiles

None.

4 EXTENSIONS, SPECIALIZATIONS, PRIVATIZATIONS OF SOP CLASSES AND TRANSFER SYNTAXES

4.1 ATL Private Tags

Private Creator Data Element

Attribute Name	Tag	Range of Private Tags	Description
Private Creator Data Element	0029, 0060	0029, 6000 – 60FF	Private

Table 4.1-1 Private Tags used by DVS

Attribute Name	Tag	Value	Description
Loop Mode	0029, 6030	Private	Private
Trigger mode	0029, 6031	Private	Private
Number of Loops	0029, 6032	Private	Private
Loop Indexes	0029, 6033	Private	Private
Loop Heart Rates	0029, 6034	Private	Private
Medications	0029, 6035	Private	Private

5 CONFIGURATION

The 90mm (3 ½") MOD 540 MB media and the 130mm (5 ¼") media 2.6GB and 5.4GB media only are used in DVS. The disks are formatted in the native NT Workstation 4 partitioned file format.

6 CHARACTER SETS

The Media Update Device will only support copy of SOP Instances containing the DICOM default character set as defined in PS 3.5.

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