



DICOM Conformance Statement

for decimal3D® iPad Application version 1.9.1

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1 Introduction

This section provides the information about the purpose, scope, and contents of this DICOM Conformance Statement.

1.1 Purpose

This document contains the DICOM Conformance Statement for .decimal's decimal3D iPad Application. The decimal3D iPad Application is intended to create and send DICOM formatted files with defined standard data types to a remote DICOM receiver. The compliance has been specified through the Service Classes, Information Object Definitions (IODs), Transfer Syntaxes, and Communication Protocols supported by the implementation.

1.2 Target Audience

This document is intended for existing and potential users of the decimal3D iPad Application. This document assumes familiarity with the DICOM standard as defined by NEMA.

1.3 General

The decimal3D iPad Application is a product of .decimal, LLC. The decimal3D iPad Application will be revised as needed to meet future DICOM standards, and as such this may result in changes being made to the IODs listed in this Conformance Statement. It is the user's responsibility to ensure that the DICOM standard being used to receive files from the decimal3D iPad Application meets the requirements as defined in this Conformance Statement.

.decimal may make changes and updates to the decimal3D iPad Application and the Conformance Statement or to retire it from usage at any time. .decimal is not liable for errors in this document or for damages resulting in the usage of this material. This Conformance Statement does not guarantee successful interconnection between the decimal3D iPad Application and user supplied remote DICOM receiver. It is also the end user's responsibility to independently verify correct functionality and accuracy of patient and treatment planning data.

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1.4 Trademarks

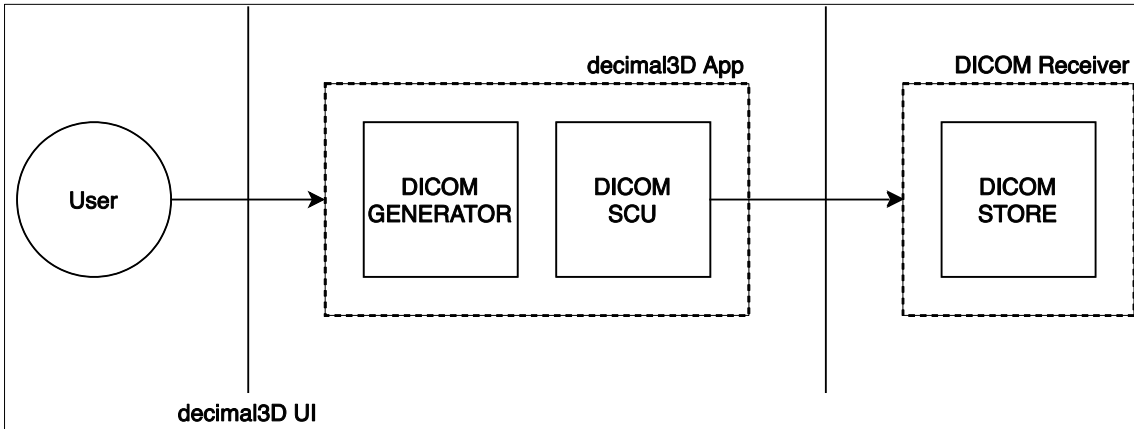
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2 Implementation Model

The decimal3D iPad Application is a stand-alone application available through the Apple iOS App Store. The application provides all of the necessary interface options and functionality for an end user to create and send a DICOM formatted file.

2.1 Application Data Flow



The decimal3D iPad Application allows trained radiation therapy professionals to perform physical scans of a patient’s intended treatment area. The application then allows users to manually contour treatment fields and design patient-specific treatment devices using the scan data. These devices can then be ordered for fabrication by our company so that they can be used for patient treatment. Once ordered, the user may choose to export the treatment device information via a DICOM RT Plan file. When the user selects a scan for which they would like to export the information, a DICOM file generator in the decimal3D iPad Application will take that information, validate it and then process it into a DICOM file format. At this point, the file is handed off to the DICOM SCU which will attempt to establish a connection with, and send the DICOM file to, the user’s entered remote DICOM Receiver.

2.2 Functional Definition of Application Entities

The decimal3D iPad Application acts as a Storage Service Class User.

2.3 Sequencing of Real World Activities

The only real world sequence that must take place is the requirement of purchase of a device (based on a scan) in the decimal3D iPad Application before export can be completed.

3 Application Entity Specifications

The decimal3D iPad Application Application Entity provides standard conformance to the following DICOM Service Object Pairs (SOP) Class as a Service Class User (SCU).

SOP Class Name	UID
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5

3.1 Number of Associations

The decimal3D iPad Application will only handle one association at a time. The application will only have a single remote DICOM receiver in memory.

3.2 Asynchronous Nature

The decimal3D iPad Application does not support asynchronous communication.

4 Supported IODs

Only the DICOM modules and tags defined in this section are created and written to by the decimal3D iPad Application based on end user inputs. If a tag is omitted from this list, it is not written by the application.

4.1 Patient Module - C.7.1.1

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Patient's Name	(0010,0010)	2	Patient's full name.
Patient ID	(0010,0020)	2	Primary identifier for the patient.
Patient's Birth Date	(0010,0030)	2	Birth date of the patient.
Patient's Sex	(0010,0040)	2	Sex of the named patient. Enumerated Values: M male F female O other
Patient Identity Removed	(0012,0062)	3	NO (decimal3D does not support identity removal)

4.2 General Study Module - C.7.2.1

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Study Instance UID	(0020,000D)	1	Unique identifier for the Study.
Study Date	(0008,0020)	2	Date of Export.
Study Time	(0008,0030)	2	Time of Export.

Attribute Name	Tag	Type	Description
Referring Physician's Name	(0008,0090)	2	Name of the patient's physician.
Study ID	(0020,0010)	2	Empty field.
Accession Number	(0008,0050)	2	Empty field.

4.3 RT Series Module - C.8.8.1

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Modality	(0008,0060)	1	RTPLAN
Series Instance UID	(0020,000E)	1	Unique identifier of the series.
Series Number	(0020,0011)	2	Empty field.
Operator's Name	(0008,1070)	2	Empty field.

4.4 Frame of Reference Module - C.7.4.1

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Frame of Reference UID	(0020,0052)	1	Uniquely identifies the frame of reference for a Series. See Section C.7.4.1.1.1 for further explanation.
Position Reference Indicator	(0020,1040)	2	Empty field.

4.5 General Equipment Module - C.7.5.1

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Manufacturer	(0008,0070)	2	“.decimal LLC”
Manufacturer's Model Name	(0008,1090)	3	“decimal3D”
Software Versions	(0018,1020)	3	Version and build of the decimal3D software at the time of Export.

4.6 RT General Plan Module - C.8.8.9

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
RT Plan Label	(300A,0002)	1	User-defined label for treatment plan (Scan Name).
RT Plan Name	(300A,0003)	3	User-defined name for treatment plan (Scan Name).
RT Plan Date	(300A,0006)	2	Date treatment plan was last modified.
RT Plan Time	(300A,000A)	2	Time treatment plan was last modified.
RT Plan Geometry	(300A,000C)	1	TREATMENT_DEVICE (RT Structure Set does not exist)

4.7 RT Prescription Module - C.8.8.10

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Prescription Description	(300A,000E)	3	The plan name
Dose Reference Sequence	(300A,0010)	3	Sequence of Dose References. One Item is included in this Sequence.
>Dose Reference Number	(300A,0012)	1	"1"
>Dose Reference Structure Type	(300A,0014)	1	"SITE"
>Dose Reference Type	(300A,0020)	1	"TARGET"

4.7 RT Patient Setup Module - C.8.8.12

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Patient Setup Sequence	(300A,0180)	1	Sequence of patient setup data for current plan. One Item is included in this Sequence.
>Patient Setup Number	(300A,0182)	1	"1"
>Patient Additional Position	(300A,0184)	1C	"Not Specified"

Attribute Name	Tag	Type	Description
>Setup Technique	(300A,01B0)	3	FIXED_SSD

4.8 RT Fraction Scheme Module - C.8.8.13

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Fraction Group Sequence	(300A,0070)	1	All beams in the scan are added to a single Fraction Group in this Sequence.
>Fraction Group Number	(300A,0071)	1	"1"
>Number of Fractions Planned	(300A,0078)	2	Empty field.
>Number of Beams	(300A,0080)	1	Number of Beams in the plan.
>Referenced Beam Sequence	(300C,0004)	1C	Sequence of treatment beams in current Fraction Group (all ordered beams will be listed).
>>Referenced Beam Number	(300C,0006)	1	Unique number to identify each beam.
>Number of Brachy Application Setups	(300A,00A0)	1	"0"

4.9 RT Beams Module - C.8.8.14

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Beam Sequence	(300A,00B0)	1	Sequence of treatment beams for current RT Plan. All ordered beams will be included in this Sequence.
>Beam Number	(300A,00C0)	1	Identification number of the Beam.
>Beam Name	(300A,00C2)	3	User-defined name for Beam. See Note 1.
>Beam Type	(300A,00C4)	1	STATIC
>Radiation Type	(300A,00C6)	2	ELECTRON
>Treatment Machine Name	(300A,00B2)	2	User-defined name identifying treatment machine to be used for beam delivery. See Note 2.
>Manufacturer	(0008,0070)	3	Manufacturer of the equipment to be used for beam delivery.

Attribute Name	Tag	Type	Description
>Primary Dosimeter Unit	(300A,00B3)	3	MU
>Source-Axis Distance	(300A,00B4)	3	Radiation source to Gantry rotation axis distance of the equipment that is to be used for beam delivery (mm).
>Beam Limiting Device Sequence	(300A,00B6)	1	Sequence of beam limiting device (collimator) jaw or leaf (element) sets. X and Y jaws are included in this Sequence.
>>RT Beam Limiting Device Type	(300A,00B8)	1	Type of beam limiting device (collimator). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1	"1"
>Number of Wedges	(300A,00D0)	1	"0"
>Number of Compensators	(300A,00E0)	1	"0"
>Number of Boli	(300A,00ED)	1	"0"
>Number of Blocks	(300A,00F0)	1	Number of shielding blocks associated with Beam.
>Block Sequence	(300A,00F4)	1C	Sequence of blocks associated with Beam. One or more Items will be included in this Sequence. Required if Number of Blocks (300A,00F0) is non-zero.
>>Source to Block Tray Distance	(300A,00F6)	2	Radiation Source to attachment edge of block tray assembly (mm).
>>Block Type	(300A,00F8)	1	APERTURE (blocking material is outside contour)
>>Block Divergence	(300A,00FA)	2	ABSENT (block edges are not shaped for beam divergence)
>>Block Mounting Position	(300A,00FB)	3	SOURCE_SIDE (block is mounted on the side of the Block Tray that is towards the radiation source)
>>Block Number	(300A,00FC)	1	Identification number of the Block. This value will be unique within the Beam in which it is created.
>>Material ID	(300A,00E1)	2	"Copper"
>>Block Thickness	(300A,0100)	2C	"14.86"

Attribute Name	Tag	Type	Description
>>Block Number of Points	(300A,0104)	2	Number of (x,y) pairs defining the block edge.
>>Block Data	(300A,0106)	2	A data stream of (x,y) pairs that comprise the block edge. The vertices form a closed polygon. Coordinates are projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm) See Note 3.
>Applicator Sequence	(300A,0107)	3	Sequence of Applicators associated with Beam.
>>Applicator ID	(300A,0108)	1	Identifier for the Applicator consisting of the applicator size (e.g. 6x6 or 15x15)
>>Applicator Type	(300A,0109)	1	Type of Applicator. ELECTRON_SQUARE ELECTRON_RECT ELECTRON_CIRC
>>Applicator Description	(300A,010A)	3	A description for the applicator. Written only if the data is not an empty string.
>>Accessory Code	(300A,00F9)	3	An identifier for the accessory. Written only if the data is not an empty string.
>>Applicator Geometry Sequence	(300A,0431)	3	Sequence describing the applicator aperture geometry.
>>>Applicator Aperture Shape	(300A,0431)	3	Aperture shape of the applicator. SYM_SQUARE SYM_RECTANGLE SYM_CIRCULAR
>>>Applicator Opening	(300A,0433)	1C	Present if Applicator Aperture Shape is SYM_SQUARE or SYM_CIRCULAR Opening (in mm) of the applicator's aperture in IEC BEAM LIMITING DEVICE coordinate system. In case of square-shaped applicator contains the length of the sides of the square. In case of circular-shaped applicators, contains the diameter of the circular aperture.
>>>Applicator Opening X	(300A,0434)	1C	Present if Applicator Aperture Shape is SYM_RECTANGLE

Attribute Name	Tag	Type	Description
			Opening (in mm) of the applicator's aperture in IEC BEAM LIMITING DEVICE coordinate system in X-Direction.
>>>Applicator Opening Y	(300A,0435)	1C	Present if Applicator Aperture Shape is SYM_RECTANGLE Opening (in mm) of the applicator's aperture in IEC BEAM LIMITING DEVICE coordinate system in Y-Direction.
>Final Cumulative Meterset Weight	(300A,010E)	1C	"1.0"
>Number of Control Points	(300A,0110)	1	"2"
>Control Point Sequence	(300A,0111)	1	Sequence of machine configurations describing treatment beam. The minimum required two Items are included in this Sequence.
>>Control Point Index	(300A,0112)	1	Index of current Control Point, starting at 0 for first Control Point.
>>Cumulative Meterset Weight	(300A,0134)	2	Cumulative weight to current control point. Cumulative Meterset Weight for the first item in Control Point Sequence shall always be zero. Cumulative Meterset Weight for the final item in Control Point Sequence shall always be equal to Final Cumulative Meterset Weight.
>>Beam Limiting Device Position Sequence	(300A,011A)	1C	Sequence of beam limiting device (collimator) jaw or leaf (element) positions. X and Y jaws are included in this Sequence for the first Control Point.
>>>Beam Limiting Device Type	(300A,00B8)	1	Type of beam limiting device (collimator). The value of this attribute shall correspond to RT Beam Limiting Device Type (300A,00B8) defined in an item of Beam Limiting Device Sequence (300A,00B6). Enumerated Values: X symmetric jaw pair in IEC X direction Y symmetric jaw pair in IEC Y direction
>>>Leaf/Jaw Positions	(300A,011C)	1	Positions of beam limiting device (collimator) leaf (element) or jaw pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8). These value match the edge positions of the user selected electron applicator.
>>Gantry Angle	(300A,011E)	1C	Gantry angle of radiation source, i.e., orientation of IEC GANTRY coordinate system with respect to IEC FIXED

Attribute Name	Tag	Type	Description
			REFERENCE coordinate system (degrees). Included only in first Control Point.
>>Gantry Rotation Direction	(300A,011F)	1C	NONE
>>Beam Limiting Device Angle	(300A,0120)	1C	Beam Limiting Device (collimator) angle, i.e., orientation of IEC BEAM LIMITING DEVICE coordinate system in respect to IED GANTRY coordinate system (degrees). Included only in first Control Point.
>>Beam Limiting Device Rotation Direction	(300A,0121)	1C	NONE
>>Patient Support Angle	(300A,0122)	1C	Patient Support (couch) angle, i.e., orientation of IEC PATIENT SUPPORT (turntable) coordinate system with respect to IEC FIXED REFERENCE coordinate system (Degrees). Included only in first Control Point.
>>Patient Support Rotation Direction	(300A,0123)	1C	NONE
>>Table Top Eccentric Angle	(300A,0125)	1C	"0"
>>Table Top Eccentric Rotation Direction	(300A,0126)	1C	NONE
>>Table Top Pitch Angle	(300A,0140)	1C	"0"
>>Table Top Pitch Rotation Direction	(300A,0142)	1C	NONE
>>Table Top Roll Angle	(300A,0144)	1C	"0"
>>Table Top Roll Rotation Direction	(300A,0146)	1C	NONE
>>Table Top Vertical Position	(300A,0128)	2C	Empty field.
>>Table Top Longitudinal Position	(300A,0129)	2C	Empty field.
>>Table Top Lateral Position	(300A,012A)	2C	Empty field.
>>Isocenter Position	(300A,012C)	2C	Empty field.
>>Source to Surface Distance	(300A,0130)	3	User specified Source to Patient Surface (skin) distance (mm).

Notes:

1. Beam Number (300A,00C0) is provided to link related information across modules, and its value should not be required to have any real-world interpretation. Beam Name (300A,00C2), a Type 3 attribute, is intended to store the primary beam identifier (often referred to as "field identifier"). Beam Description (300A,00C3), a Type 3 attribute, is intended to store additional beam identifying information (often referred to as "field name"). Equipment supporting both these attributes should state this clearly in the Conformance Statement.

2. The DICOM standard does not support the transmission of treatment unit modeling information such as depth doses and beam profiles.
3. Block coordinates may not be transmitted when the receiving system does not have internal mechanisms to use or store such data. For example, a plan sent from this software to a Record and Verify (R&V) system will contain the block data for blocked beams. Subsequent transfer of beam data from the R&V system may omit this data since the R&V system may not be configured to store it.

4.10 Approval Module - C.8.8.16

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
Approval Status	(300E,0002)	1	UNAPPROVED (decimal3D does not support a formal review process)

4.11 SOP Common Module - C.12.1

Used for DICOM RT Plan writing.

Attribute Name	Tag	Type	Description
SOP Class UID	(0008,0016)	1	Unique identifier for the SOP Class.
SOP Instance UID	(0008,0018)	1	Unique identifier for the SOP Instance (generated new with each export).
Specific Character Set	(0008,0005)	1C	"ISO_IR 100"
Instance Creation Date	(0008,0012)	3	Date the SOP Instance was created.
Instance Creation Time	(0008,0013)	3	Time the SOP Instance was created.