Elekta

DICOM Conformance Statement

for

Elekta Precise Treatment System™

Release 4.0 and 4.1

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Issued By:

Elekta
Linac House
Fleming Way
CRAWLEY
West Sussex RH10 9RR
United Kingdom

Tel: +44 (0)1293 544422
Fax: +44 (0)1293 654321
http://www.elekta.com

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1. Introduction

This chapter provides general information about the purpose, scope and contents of this Conformance Statement.

1.1 Scope and field of application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Elekta Oncology Systems Ltd. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X-1998 standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntax's.

The field of application is the integration of the Elekta Oncology Systems equipment into an environment of medical devices.

This Conformance Statement should be read in conjunction with the DICOM standard and its addenda.

1.2 Intended audience

This Conformance Statement is intended for:

- (potential) customers,
- system integrators of medical equipment,
- marketing staff interested in system functionality,
- software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

1.3 Contents and structure

The DICOM Conformance Statement is contained in chapter 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2-1998 Additionally, the Appendices following chapter 7 specify the details of the applied IODs, SCP-specific status codes and extended configuration details.

1.4 Used definitions, terms and abbreviations

- DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see DICOM PS 3 1998.
- The word Elekta in this document refers to Elekta.
- The word Desktop in this document refers to the Elekta Precise Treatment System Product, Release 4.0 and Release 4.1

1.5 References

[DICOM PS 3 1998]
The Digital Imaging and Communications in Medicine (DICOM) standard:
NEMA PS 3.X (X refers to the part 1 - 13) and Supplements.
National Electrical Manufacturers Association (NEMA) Publication Sales
1300 N. 17th Street, Suite 1847
Rosslyn, Va. 22209, United States of America

1.6 Important notes to the reader

This Conformance Statement by itself does not guarantee successful interoperability of Elekta equipment with non-Elekta equipment. The user (or user's agent) should be aware of the following issues:

- Scope

The goal of DICOM is facilitate inter-connectivity rather than interoperability. Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into a networked environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Elekta equipment with non-Elekta equipment. It is the user's responsibility to analyse thoroughly the application requirements and to specify a solution that integrates Elekta equipment with non-Elekta equipment.

- Validation

Elekta equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where Elekta equipment is to be linked to non-Elekta equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of prescription and prescription related data. Prospective users may contact Elekta for up-to-date information regarding available validation status and any known compatibility issues with specific 3rd party vendors. Ultimately, however, it is the responsibility of the user (or user's agent) to specify an appropriate test suite and to carry out additional validation tests on combinations of equipment used within the users environment. In particular integrators should not assume that the Elekta equipment would always be able to detect all forms of invalid data originating from 3rd party equipment.

- New versions of the DICOM Standard

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Elekta is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Elekta reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Elekta provider linking to Elekta equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Elekta equipment may lead to loss of connectivity and/or incompatibility.

2. Implementation Model

Desktop is a networked information system comprising Control Systems and Operators Consoles for use with Elekta Linear Accelerators, together with a centralised Patient database for Prescription Preparation, Verification and Recording purposes.

2.1 Application Data Flow Diagram

Desktop behaves as a single Application Entity (AE). The related Implementation Model is shown in Figure 1.

2.2 Functional definition of Application Entity

Desktop application entity acts as Service Class Provider (SCP) of Verification and Storage Service Classes.

The Application Entity is active when the Desktop system is switched on.

2.3 Sequencing of Real-World Activities

Not applicable.

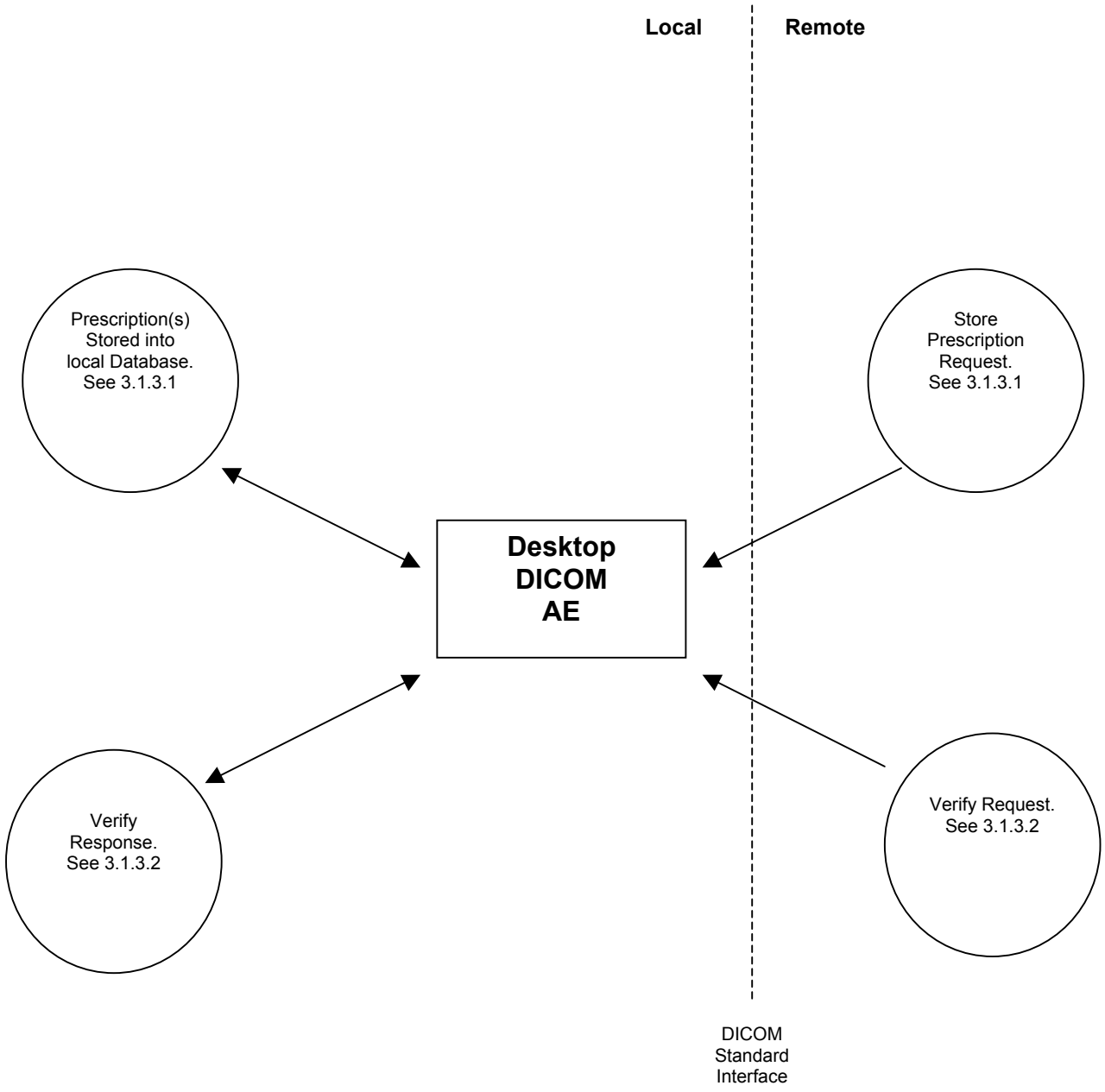

Figure 1 Desktop Implementation Model

3. AE Specifications

3.1 Desktop AE Specification

Desktop Application Entity provides Standard Conformance to the following DICOM V3.0 SOP classes as an SCP:

Table 1 SOP Classes supported by Desktop as SCP

SOP Class Name	UID
RT Plan Storage - STORE	1.2.840.10008.5.1.4.1.1.481.5
Verification	1.2.840.10008.1.1

3.1.1 Association Establishment Policies

3.1.1.1 General

The maximum PDU size for Desktop is configurable from a minimum of 1024 bytes to a maximum of 31000 bytes. (The default is 16K = 16384 bytes).

3.1.1.2 Number of Associations

Desktop will support one active association as a Service Class Provider at a time.
The number of simultaneous pending associations supported is configurable. The default is 5.

3.1.1.3 Asynchronous Nature

Desktop does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

Release 4.0
The Implementation Class UID is: 1.3.46.423632.128000.4.0.0
The implementation version name is: Desktop_4.0.0
Release 4.1
The Implementation Class UID is: 1.3.46.423632.128000.4.1.0
The implementation version name is: Desktop_4.1.0

3.1.2 Association Initiation Policy

Desktop does not initiate associations.

3.1.3 Association Acceptance Policy

Desktop Application Entity accepts associations for the following purposes:

- To allow remote applications to store prescriptions into the Desktop database (see section 3.1.3.1 below)
- To allow remote applications to verify application level communication with Desktop (see section 3.1.3.2 below)

Desktop may accept association requests from remote stations depending on Desktop configuration:

- The Application Entity rejects association requests from unknown applications i.e. applications that offer an unknown “calling AE title” or reside on an unrecognised TCP/IP host. An application is known if and only if it is defined during configuration of Desktop.
- The Application Entity rejects association requests that incorrectly address Desktop AE, i.e. from applications that offer a wrong “called AE title”. Desktop AE title is defined during configuration of the system (See Section 6.1.1).

3.1.3.1 Store Prescriptions into Desktop Database

3.1.3.1.1 Associated Real World Activity

Desktop accepts associations from remote systems that wish to send prescriptions for storage into the Desktop database.

3.1.3.1.2 Presentation Context Table

Any of the presentation contexts shown in Table 2 below are acceptable:

Table 2 Acceptable Presentation Contexts for Desktop Prescription Storage

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
RT Plan Storage - STORE	1.2.840.10008.5.1.4.1.1.481.5	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

3.1.3.1.3 C-STORE SCP Conformance

Desktop provides standard conformance.

The AE is a Conformance Level 0 Storage SCP: not all DICOM Type 1 and 2 attributes are stored.

APPENDIX A.1 specifies which attributes from the received C-STORE requests are stored for internal Desktop use. All other received attributes will be discarded.

APPENDIX B lists the specific C-STORE response status codes returned by the AE.

The duration of the storage of the prescription is determined by the operator of Desktop.

3.1.3.1.4 Presentation Context Acceptance Criterion

Desktop accepts all contexts in the intersection of the proposed and acceptable presentation contexts. There is no check for duplicate contexts. Duplicate contexts are accepted.

3.1.3.1.5 Transfer Syntax Selection Policies

Desktop prefers its native byte ordering (Little Endian) , and will prefer explicit over implicit VR.

3.1.3.2 Verify Application Level Communication

3.1.3.2.1 Associated Real World Activity

Desktop accepts associations from systems that wish to verify the application level communication using the C-ECHO command.

3.1.3.2.2 Presentation Context Table

Any of the presentation contexts shown in Table 3 below are acceptable:

Table 3 Acceptable Presentation Contexts for Verification

Presentation Context Table					
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	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

3.1.3.2.3 C-ECHO SCP Conformance

Desktop provides standard conformance.

3.1.3.2.4 Presentation Context Acceptance Criterion

Desktop accepts all contexts in the intersection of the proposed and acceptable presentation contexts. There is no check for duplicate contexts. Duplicate contexts are accepted.

3.1.3.2.5 Transfer Syntax Selection Policies

Desktop prefers its native byte ordering (Little Endian) , and will prefer explicit over implicit VR.

4. Communication Profiles

4.1 Supported Communication Stacks

Desktop application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.2 TCP/IP Stack

Desktop inherits its TCP/IP stack from the Microsoft Windows NT Server (Version 4.0 SP6a) operating system upon which it executes.

4.3 Physical Media Support

Desktop supports Ethernet ISO.8802-3.
On Elekta supplied hardware platforms the connection type provided is 100/10BASE-T (RJ45 twisted pair).

5. Extensions/Specialisations/Privatisations

Not applicable.

6. Configuration

Desktop DICOM settings are configured by means of a DICOM-specific configuration program.
Configuration changes are effective immediately they are committed.
Configuration is intended to be performed by Elekta service engineers only.

6.1 AE Title/Presentation Address mapping

6.1.1 Local AE Titles and Presentation Addresses

The local Application Entity Title is configurable. The default is “EOS_RTD”

The listen port number is configurable. The default is 104.

6.1.2 Remote AE Titles and Presentation Addresses

All remote applications that wish to communicate with Desktop must be defined at Desktop DICOM configuration time. The following information must be provided:

- the remote AE Title.
- the TCP/IP host name on which the remote application resides.
- the IP address of the remote host.

6.2 Configurable Parameters

6.2.1 Communication Parameters

- the Maximum PDU size is configurable.
- the maximum number of simultaneous pending associations is configurable.
- Dicom Upper Layer Timeouts are configurable.

6.2.2 Desktop Attribute Mapping

- the mapping of certain Desktop Prescription parameters from attributes in received RT Plan storage requests can be explicitly disabled through configuration. (See Appendix C).

7. Support of Extended Character Sets

None.

APPENDIX A Applied RT Plan IOD and Mapping to Desktop Database

A.1 Import of RT Plan Prescriptions

The modules selected from the RT Plan IOD of DICOM for prescription import are given in Table 4 below. If a module is not listed, none of the attributes in that module is stored by Desktop.

Table 4 Applied Modules in the RT Plan IOD for Import (SCP Role)

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	RT Series	M
Equipment	General Equipment	M
Plan	RT General Plan	M
	RT Prescription	U
	RT Tolerance Tables	U
	RT Patient Setup	U
	RT Fraction Scheme	U
	RT Beams	C
	Approval	U
	SOP Common	M

A.2 RT Plan IOD Modules

Table 5 to Table 16 below specify, for each of the applied modules above, the attributes stored by Desktop, further details of mapping onto the Desktop database, and any attribute specific constraints applicable to their use. Attributes that are completely **ignored** by Desktop are shown shaded.

Ignored attributes are not stored into the Desktop patient database. **However, all DICOM prescriptions must conform to the DICOM standard.** If any part of a prescription does not conform to the standard then that prescription is not saved into the database and the storage request is rejected. Thus, Desktop performs validation of the entire applied IOD. I.e. where attributes irrelevant to Desktop are included in a message, they must still have values that are valid according to the DICOM standard. Storage requests containing invalid attributes will be REJECTED. **(See** Table 17**, Status Code A901).**

Note that Desktop configuration settings may determine whether certain attributes are actually used to map to Desktop parameters (see Appendix C).

Table 5 RT Plan Storage SOP Class (SCP) – Patient Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patients Name	(0010,0010)	PN 1	2	Treated as Type 1 attribute. See Note I.
Patient ID	(0010, 0020)	LO 1	2	Treated as Type 1 attribute. See Note I and Note II.
Patient's Birth Date	(0010, 0030)	DA 1	2	See Note III.
Patients Sex	(0010, 0040)	CS 1	2	See Note III.
Referenced Patient Sequence	(0008, 1120)	SQ 1	3	Ignored
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Patient's Birth Time	(0010, 0032)	TM 1	3	
Other Patient IDs	(0010, 1000)	LO 1-N	3	Up to 5 values stored.
Other Patient Names	(0010, 1001)	PN 1-N	3	Up to 5 values stored.
Ethnic Group	(0010, 2160)	SH 1	3	
Patient Comments	(0010, 4000)	LT 1	3	

Note I Handling of Empty Patient Identification Attributes

The Patient ID (0010, 0020) and Patient Name (0010, 0010) attributes of the Patient Module are specified by DICOM as Type 2 and so may legally have zero length.

As a safety measure, however, **Desktop** treats these attributes as Type 1 and will REJECT any RT Plan Storage request containing zero length values for these attributes. **(See Table 17, Status Code C001)**.

Note II Patient ID Already Exists in Desktop Database

If a patient with the Patient ID specified in the RT Plan Storage request already exists in the Desktop database, no further Patient Module attributes in the request will be imported. The check for an existing Patient ID is insensitive to case or leading/trailing spaces.

Desktop will REJECT any RT Plan Storage request where an existing patient prescription is currently locked for treatment or editing by another application. **(See Table 17, Status Code A701).**

Note III Matching of Birth Date, Sex Attributes for Existing Patients

If a Patient with the specified Patient ID already exists in the Desktop database, and existing Date of Birth and/or Sex details are also available, then any corresponding Birth Date and/or Patient Sex attributes present in the RT Plan Storage request MUST match the respective existing data, otherwise the request will be REJECTED **(See Table 17 Status Code C002).**

Table 6 RT Plan Storage SOP Class (SCP) – General Study Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Study Instance UID	(0020, 000D)	UI 1	1	Logged to Dicom Plan Information record if present. See Note VI. * Up to 5 values stored
Study Date	(0008, 0020)	DA 1	2	
Study Time	(0008, 0030)	TM 1	2	
Referring Physicians Name	(0008, 0090)	PN 1	2	
Study ID	(0020, 0010)	SH 1	2	
Accession Number	(0008, 0050)	SH 1	2	
Study Description	(0008, 1030)	LO 1	3	
Physician(s) of Record	(0008, 1048)	PN 1-N	3 *	
Name of Physician(s) Reading Study	(0008, 1060)	PN 1-N	3 *	
Referenced Study Sequence	(0008, 1110)	SQ 1	3	Ignored
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 7 RT Plan Storage SOP Class (SCP) – RT Series Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Modality	(0008, 0060)	CS 1	1	"RTPLAN" only. **(See Table 17, Status Code A900)**
Series Instance UID	(0020, 000E)	UI 1	1	Logged to Dicom Plan Information record if present. See Note VI.
Series Number	(0020, 0011)	IS 1	2	
Series Description	(0008, 103E)	LO 1	3	
Referenced Study Component Sequence	(0008, 1111)	SQ 1	3	Ignored
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 8 RT Plan Storage SOP Class (SCP) – General Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Manufacturer	(0008, 0070)	LO 1	2	Ignored
Institution Name	(0008, 0080)	LO 1	3	
Institution Address	(0008, 0081)	ST 1	3	
Station Name	(0008, 1010)	SH 1	3	
Institutional Department Name	(0008, 1040)	LO 1	3	
Manufacturer's Model Name	(0008, 1090)	LO 1	3	
Device Serial Number	(0018, 1000)	LO 1	3	
Software Version	(0018, 1020)	LO 1-N	3	
Spatial Resolution	(0018, 1050)	DS 1	3	
Date of Last Calibration	(0018, 1200)	DA 1-N	3	
Time of Last Calibration	(0018, 1201)	TM 1-N	3	
Pixel Padding Value	(0028, 0120)	US 1	3	

Table 9 RT Plan Storage SOP Class (SCP) – RT General Plan Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
RT Plan Label	(300A, 0002)	SH 1	1	Combined and used for name of new Treatment Site. See Note IV.
RT Plan Name	(300A, 0003)	LO 1	3	
RT Plan Description	(300A, 0004)	ST 1	3	Treatment Site description
Operators Name	(0008, 1070)	PN 1-N	2 *	Logged to Dicom Plan Information record if present. See Note VI. * Only 1st value stored
RT Plan Date	(300A, 0006)	DA 1	2	
RT Plan Time	(300A, 0007)	TM 1	2	
Treatment Protocols	(300A, 0009)	LO 1-N	3	Ignored
Treatment Intent	(300A, 000A)	CS 1	3	
Treatment Sites	(300A, 000B)	LO 1-N	3	
RT Plan Geometry	(300A, 000C)	CS 1	1	
Referenced Structure Set Sequence	(300C, 0060)	SQ 1	1C	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Referenced Dose Sequence	(300C, 0080)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Referenced RT Plan Sequence	(300C, 0002)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>RT Plan Relationship	(300A, 0055)	CS 1	1C	

Note IV Creation of Treatment Site

Each successfully imported RT Plan Storage request shall cause creation of a single new Treatment Site (i.e. course of treatment) for the specified Patient, containing a single Phase.
The RT Plan Label and RT Plan Name attributes are used as the basis for the new Treatment Site name. If necessary, the generated name will be forced to be unique for the Patient by the appending of a sequence number "-2", "-3" etc.
The Phase Name is derived from the RT Plan Label. The Phase Description will contain the RT Plan Label and Name, and the AE title of the remote application.

Note VI Dicom Plan Information Record, Dicom Beam Information Record

Certain attributes are identified as being stored to the 'Dicom Plan Information Record' or 'Dicom Beam Information Record'. These are internal areas of the Desktop database whose contents are not directly accessible or visible to the end user. Their purpose is primarily to facilitate compatibility with future releases of Desktop applications.

Table 10 RT Plan Storage SOP Class (SCP) – RT Prescription Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Prescription Description	(300A, 000E)	ST 1	3	Ignored
Dose Reference Sequence	(300A, 0010)	SQ 1	3	Used to create new Dose Monitoring Points for the new Course of Treatment.
>Dose Reference Number	(300A, 0012)	IS 1	1C	Root of new DMP Name (combined with Dose Reference Description). Number must be unique within sequence. **(See Table 17, Status Code A903)**
>Dose Reference Structure Type	(300A, 0014)	CS 1	1C	Ignored
>Dose Reference Description	(300A, 0016)	LO 1	3	If specified, combined with Dose Reference Number to form new DMP Name (truncated to 64 chars total).
>Referenced ROI Number	(3006, 0084)	IS 1	1C	Ignored
>Dose Reference Point Coordinates	(300A, 0018)	DS 3	1C	
>Nominal Prior Dose	(300A, 001A)	DS 1	3	DMP Adjusted Dose (if non-zero, otherwise zero assumed)
>Dose Reference Type	(300A, 0020)	CS 1	1C	DMP Type
>Constraint Weight	(300A, 0021)	DS 1	3	Ignored
>Delivery Warning Dose	(300A, 0022)	DS 1	3	
>Delivery Maximum Dose	(300A, 0023)	DS 1	3	
>Target Minimum Dose	(300A, 0025)	DS 1	3	
>Target Prescription Dose	(300A, 0026)	DS 1	3	
>Target Maximum Dose	(300A, 0027)	DS 1	3	DMP Max Dose (if Dose Reference Type is 'TARGET')
>Target Underdose Volume Fraction	(300A, 0028)	DS 1	3	Ignored
>Organ at Risk Full-volume Dose	(300A, 002A)	DS 1	3	
>Organ at Risk Limit Dose	(300A, 002B)	DS 1	3	
>Organ at Risk Maximum Dose	(300A, 002C)	DS 1	3	DMP Max Dose (if Dose Reference Type is 'ORGAN_AT_RISK')
>Organ at Risk Overdose Volume Fraction	(300A, 002D)	DS 1	3	Ignored

Table 11 RT Plan Storage SOP Class (SCP) – RT Tolerance Tables Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Tolerance Table Sequence	(300A, 0040)	SQ 1	3	Tolerance Tables. See Appendix C.
>Tolerance Table Number	(300A, 0042)	IS 1	1C	Number must be unique within sequence. **(See Table 17, Status Code A904)**.
>Tolerance Table Label	(300A, 0043)	SH 1	3	If specified, must match name of an existing Desktop Tolerance Table. See Note VI. **(See Table 17, Status Code C018)**.
>Gantry Angle Tolerance	(300A, 0044)	DS 1	3	If specified, Tolerance values must match respective values in a corresponding Desktop Tolerance Table. See Note VI. **(See Table 17, Status Code C018)**.
>Beam Limiting Device Angle Tolerance	(300A, 0046)	DS 1	3	
>Beam Limiting Device Tolerance Sequence	(300A, 0048)	SQ 1	3	
>>RT Beam Limiting Device Type	(300A, 00B8)	CS 1	1C	
>>Beam Limiting Device Position Tolerance	(300A, 004A)	DS 1	1C	
>Patient Support Angle Tolerance	(300A, 004C)	DS 1	3	
>Table Top Eccentric Angle Tolerance	(300A, 004E)	DS 1	3	
>Table Top Vertical Position Tolerance	(300A, 0051)	DS 1	3	
>Table Top Longitudinal Position Tolerance	(300A, 0052)	DS 1	3	
>Table Top Lateral Position Tolerance	(300A, 0053)	DS 1	3	

Note VI Interpretation of Tolerance Table Data

Desktop Tolerance Table names are global within the scope of Desktop. Mapping from Dicom Tolerance Tables to Desktop Tolerance Tables is based on the Tolerance Table Label (300A, 0043):

If the Tolerance Table Label is present but does not map onto the name of an existing Desktop Tolerance Table, Desktop will REJECT the RT Plan Storage request.

If the Tolerance Table Label corresponds to an existing Desktop Tolerance Table, then any Parameter Tolerance values present in the RT Plan Storage request will be compared with the respective values in the Desktop Table. In the case of a match, the existing Tolerance Table will be used for all Prescribed Fields created from Beams that reference this Tolerance Table. In the case of any mismatch of Parameter Tolerances, Desktop will REJECT the RT Plan Storage request

If the Tolerance Table Label is not specified, the table in the RT Plan Storage request will be ignored and a status code WARNING ELEMENTS DISCARDED will be returned to the remote application **(See Table 17, Status Code B006)**. In such cases, all Prescribed Fields created from Beams that reference this unlabelled table will be created with UNPRESCRIBED Tolerance Table parameters. It will be necessary for the operator of Desktop to specify a valid Desktop Tolerance Table for these Prescribed Fields before they become valid for treatment.

Mapping of Tolerance Table data can be disabled by configuration. **(See Table 18 in Appendix C).**

Table 12 RT Plan Storage SOP Class (SCP) – RT Patient Setup Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patient Setup Sequence	(300A, 0180)	SQ 1	1	Setup Notes. Only created if referenced by Fraction Groups or Beams.
>Patient Setup Number	(300A, 0182)	IS 1	1	Number must be unique within sequence. **(See Table 17, Status Code A905)**.
>Patient Position	(0018, 5100)	CS 1	1C	Setup Note Text (When referenced)
>Patient Additional Position	(300A, 0184)	LO 1	1C	
>Fixation Device Sequence	(300A, 0190)	SQ 1	3	
>>Fixation Device Type	(300A, 0192)	CS 1	1C	Setup Note Text (When referenced)
>>Fixation Device Label	(300A, 0194)	SH 1	2C	
>>Fixation Device Description	(300A, 0196)	ST 1	3	
>>Fixation Device Position	(300A, 0198)	SH 1	3	
>Shielding Device Sequence	(300A, 01A0)	SQ 1	3	
>>Shielding Device Type	(300A, 01A2)	CS 1	1C	Setup Note Text (When referenced)
>>Shielding Device Label	(300A, 01A4)	SH 1	2C	
>>Shielding Device Description	(300A, 01A6)	ST 1	3	
>>Shielding Device Position	(300A, 01A8)	SH 1	3	
>Setup Technique	(300A, 01B0)	CS 1	3	Setup Note Text (When referenced)
>Setup Technique Description	(300A, 01B2)	ST 1	3	
>Setup Device Sequence	(300A, 01B4)	SQ 1	3	
>>Setup Device Type	(300A, 01B6)	CS 1	1C	Setup Note Text (When referenced)
>>Setup Device Label	(300A, 01B8)	SH 1	2C	
>>Setup Device Description	(300A, 01BA)	ST 1	3	
>>Setup Device Parameter	(300A, 01BC)	DS 1	2C	
>>Setup Reference Description	(300A, 01D0)	ST 1	3	Ignored
>Table Top Vertical Setup Displacement	(300A, 01D2)	DS 1	3	
>Table Top Longitudinal Setup Displacement	(300A, 01D4)	DS 1	3	
>Table Top Lateral Setup Displacement	(300A, 01D6)	DS 1	3	

Table 13 RT Plan Storage SOP Class (SCP) – RT Fraction Scheme Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Fraction Group Sequence	(300A, 0070)	SQ 1	1	Used to create Fractions for new Phase
>Fraction Group Number	(300A, 0071)	IS 1	1	Fraction Name. Number must be unique within sequence. **(See Table 17, Status Code A906)**.
>Referenced Patient Setup Number	(300C, 006A)	IS 1	3	If specified, must match a Patient Setup Number (300A, 0182) included in the Patient Setup Module. Data in referenced Patient Setup will be used as Fraction Note entries for this Fraction **(See Table 17, Status Code A905)**.
>Referenced Dose Sequence	(300C, 0080)	SQ 1	3	Ignored
>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>Referenced Dose Reference Sequence	(300C, 0050)	SQ 1	3	
>>Referenced Dose Reference Number	(300C, 0051)	IS 1	1C	
>>Constraint Weight	(300A, 0021)	DS 1	3	
>>Delivery Warning Dose	(300A, 0022)	DS 1	3	
>>Delivery Maximum Dose	(300A, 0023)	DS 1	3	
>>Target Minimum Dose	(300A, 0025)	DS 1	3	
>>Target Prescription Dose	(300A, 0026)	DS 1	3	
>>Target Maximum Dose	(300A, 0027)	DS 1	3	
>>Target Underdose Volume Fraction	(300A, 0028)	DS 1	3	
>>Organ at Risk Full-volume Dose	(300A, 002A)	DS 1	3	
>>Organ at Risk Limit Dose	(300A, 002B)	DS 1	3	
>>Organ at Risk Maximum Dose	(300A, 002C)	DS 1	3	
>>Organ at Risk Overdose Volume Fraction	(300A, 002D)	DS 1	3	
>Number of Fractions Planned	(300A, 0078)	IS 1	2	Number of Fractions prescribed for this Fraction
>Number of Fractions Per Day	(300A, 0079)	IS 1	3	If specified, used to define Fractions and Fraction Sequence for the new Phase
>Repeat Fraction Cycle Length	(300A, 007A)	IS 1	3	
>Fraction Pattern	(300A, 007B)	LT 1	3	

>Number of Beams	(300A, 0080)	IS 1	1	Number of Fields in Fraction
>Referenced Beam Sequence	(300C, 0004)	SQ 1	1C	Fields included in Fraction. Fields will be created in the new Fraction in the order in which they appear in the Referenced Beam Sequence. The number of items in the Referenced Beam Sequence must match the Number of Beams attribute (300A, 0080). **(See Table 17, Status Code A906)**.
>>Referenced Beam Number	(300C, 0006)	IS 1	1C	Must match a Beam Number (300A, 00C0) included in the Beam Sequence (300A, 00B0) in the RT Beams Module. **(See Table 17, Status Code A906)**.
>>Beam Dose Specification Point	(300A, 0082)	DS 3	3	Ignored
>>Beam Dose	(300A, 0084)	DS 1	3	If specified, value for a Beam must be the same in all Fraction Groups. See Note VII, Note X. **(See Table 17, Status Code C017)**.
>>Beam Meterset	(300A, 0086)	DS 1	3	If specified, value for a Beam must be the same in all Fraction Groups. See Note VII, Note VIII, Note X . **(See Table 17, Status Code C017)**.
>Number of Brachy Application Setups	(300A, 00A0)	IS 1	1	Must be 0**.** **(See Table 17, Status Code C015)**.
>Referenced Brachy Application Setup Sequence	(300C, 000A)	SQ 1	1C	Ignored
>>Referenced Brachy Application Setup Number	(300C, 000C)	IS 1	1C	
>>Brachy Application Setup Dose Specification Point	(300A, 00A2)	DS 3	3	
>>Brachy Application Setup Dose	(300A, 00A4)	DS 1	3	

Note VII Desktop-Specific Restrictions on Beam Dosimetry & Fraction Groups

In the Dicom data model the Beam Meterset (300A, 0086) is specified as an attribute of the Fraction Group within the Fraction Group Sequence (300A, 0070). This Beam Meterset value is used in conjunction with the Final Cumulative Meterset Weight (300A, 010E) and Cumulative Meterset Weight (300A, 0134) values in the RT Beams Module to derive the actual dosimetric values to be prescribed for a Beam and its Control Points.

Desktop data model allows Prescribed Fields to be grouped into one or more Fractions for treatment. In Desktop, however, the Prescribed MU to be delivered for a given Field is stored as an attribute of the **Field**, not of the **Fraction** in which it is being delivered.

Desktop will REJECT any RT Plan Storage request if the Beam Meterset (300A, 0086) value for any Referenced Beam Number (300C, 0006) in a Fraction Group is specified to be a different value to that specified in another Fraction Group**.**

I.e. if Beam Meterset is specified for a Beam, it must be specified as the same value in all Fraction Groups in which the Beam appears.

(See Table 17, Status Code C017).

Similarly, in the Dicom model, Beam Dose (300A, 0084) for a Beam is specified as an attribute of the Fraction Group in which the Beam is used. This Beam Dose is used in conjunction with the Cumulative Dose Reference Coefficient (300A, 010C) to derive the dose contribution of a Beam's Control Point to a Dose Reference.

Desktop will REJECT any RT Plan Storage request if the Beam Dose (300A, 0084) value for any Referenced Beam Number (300C, 0006) in a Fraction Group is specified to be a different value to that specified in another Fraction Group.

I.e. if Beam Dose is specified for a Beam, it must be specified as the same value in all Fraction Groups in which the Beam appears.

(See Table 17, Status Code C017).

Note VIII Handling of Missing Beam Meterset Attributes

The Beam Meterset (300A 0086) attribute is specified by Dicom as Type 3, and is part of an optional IOD module, so it may legally be missing from an RT Plan Storage request.
If this attribute is not present for a particular Referenced Beam Number in any Fraction Group in which the Beam appears, then the Prescribed Field will be created in the Desktop database with UNPRESCRIBED MU parameters. It will be necessary for the operator of Desktop to enter the Prescribed MU data for the Field and its Control Points before the Field becomes valid for treatment.

Note X Handling of Missing Beam Dose Attributes

The Beam Dose (300A 0084) attribute is specified by Dicom as Type 3, and is part of an optional IOD module, so it may legally be missing from an RT Plan Storage request.
If this attribute is not present for a particular Referenced Beam Number in any Fraction Group in which the Beam appears, AND the Beam specifies a Referenced Dose Reference Sequence (300C, 0050), then Desktop will create the respective dose contributions UNPRESCRIBED. It will be necessary for the operator of Desktop to enter the Field Dose Contribution data before the Field becomes valid for treatment.

Table 14 RT Plan Storage SOP Class (SCP) – RT Beams Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Beam Sequence	(300A, 00B0)	SQ 1	1	Used to create Prescribed Fields for new Treatment Site and Phase.
>Beam Number	(300A, 00C0)	IS 1	1	Combined and used for Prescribed Field Name. Numbers must be unique within sequence. **(See Table 17, Status Code A902).**
>Beam Name	(300A, 00C2)	LO 1	3	
>Beam Description	(300A, 00C3)	ST 1	3	Prescribed Field Description
>Beam Type	(300A, 00C4)	CS 1	1	Should be consistent with Control Point contents, i.e. STATIC Beams should prescribe no movements, DYNAMIC Beams should (else WARNING). **(See Table 17, Status Code B006).**
>Radiation Type	(300A, 00C6)	CS 1	2	"PHOTON" or "ELECTRON" only **(See Table 17, Status Code C005).**
>Treatment Machine Name	(300A, 00B2)	SH 1	2	Treated as Type 1. Must match an existing Desktop Linac Name. **(See Table 17, Status Codes C003,C004)**
>Manufacturer	(0008, 0070)	LO 1	3	Logged to Dicom Beam Information record if present. See Note VI.
>Institution Name	(0008, 0080)	LO 1	3	
>Institution Address	(0008, 0081)	ST 1	3	
>Institutional Department Name	(0008, 1040)	LO 1	3	
>Manufacturers Model Name	(0008, 1090)	LO 1	3	
>Device Serial Number	(0018, 1000)	LO 1	3	If specified, must match default Linac ID. **(See Table 17, Status Code C004).**
>Primary Dosimeter Unit	(300A, 00B3)	CS 1	3	If specified, "MU" only, else assumed to be "MU". See Note X. **(See Table 17, Status Code C00A).**
>Referenced Tolerance Table Number	(300C, 00A0)	IS 1	3	If specified, must match a Tolerance Table Number (300A, 0042) included in the Tolerance Table Module. See Note VI. **(See Table 17, Status Code A904).**
>Source-Axis Distance	(300A, 00B4)	DS 1	3	Ignored
>Beam Limiting Device Sequence	(300A, 00B6)	SQ 1	1	Must specify a complete set of BLD's (i.e. ASYMY and [ASYMX and/or MLCX]) **(See Table 17, Status Code C007).**
>>RT Beam Limiting Device Type	(300A, 00B8)	CS 1	1	"ASYMX", "ASYMY", "MLCX" only. If MLCX, must match capability of the named Treatment Machine (300A, 00B2). **(See Table 17, Status Code C006).**
>>Source to Beam Limiting Device Distance	(300A, 00BA)	DS 1	3	Ignored
>>Number of Leaf/Jaw Pairs	(300A, 00BC)	IS 1	1	40 or 1 only (i.e. MLC or Diaphragms) **(See Table 17, Status Code C006).**
>>Leaf Position Boundaries	(300A, 00BE)	DS 3-N	2C	Ignored
>Referenced Patient Setup Number	(300C, 006A)	IS 1	3	If specified, must match a Patient Setup Number (300A, 0182) included in the Patient Setup Module. **(See Table 17, Status Code A905).** Data in referenced Patient Setup will be used as Field Note entries for this Field.

>Referenced Reference Image Sequence	(300C, 0042)	SQ 1	3	Ignored
>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>>Reference Image Number	(300A, 00C8)	IS 1	1C	
>>Start Cumulative Meterset Weight	(300C, 0008)	DS 1	3	
>>End Cumulative Meterset Weight	(300C, 0009)	DS 1	3	
>Planned Verification Image Sequence	(300A, 00CA)	SQ 1	3	
>>Start Cumulative Meterset Weight	(300C, 0008)	DS 1	3	
>>Meterset Exposure	(3002, 0032)	DS 1	3	
>>End Cumulative Meterset Weight	(300C, 0009)	DS 1	3	
>>RT Image Plane	(3002, 000C)	CS 1	3	
>>X-Ray Image receptor Angle	(3002, 000E)	DS 1	3	
>>RT Image Orientation	(3002, 0010)	DS 6	3	
>>RT Image Position	(3002, 0012)	DS 2	3	
>>RT Image SID	(3002, 0026)	DS 1	3	
>>Imaging Device-Specific Acquisition Parameters	(300A, 00CC)	LO 1-N	3	
>>Referenced Reference Image Number	(300C, 0007)	IS 1	3	
>Treatment Delivery Type	(300A, 00CE)	CS 1	3	If specified, “TREATMENT” only, else assumed to be “TREATMENT”. **(See Table 17, Status Code C016).**
>Referenced Dose Sequence	(300C, 0080)	SQ 1	3	Ignored
>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>Number of Wedges	(300A, 00D0)	IS 1	1	1 or 0 only. **(See Table 17, Status Code C00B).**
>Wedge Sequence	(300A, 00D1)	SQ 1	1C	Number of items in the Wedge Sequence must match the Number of Wedges (300A, 00D0) attribute. **(See Table 17, Status Code A902).**
>>Wedge Number	(300A, 00D2)	IS 1	1C	Must be consistent with any specified Referenced Wedge Number (300C, 00C0) used in Wedge Position Sequence (300A, 0116). **(See Table 17, Status Code A902).**
>>Wedge Type	(300A, 00D3)	CS 1	2C	Treated as Type 1. “MOTORIZED” only. **(See Table 17, Status Code C00B).**
>>Wedge ID	(300A, 00D4)	SH 1	3	Ignored
>>Wedge Angle	(300A, 00D5)	IS 1	2C	
>>Wedge Factor	(300A, 00D6)	DS 1	2C	
>>Wedge Orientation	(300A, 00D8)	DS 1	2C	Must be 0 or empty. **(See Table 17, Status Code C00B).**
>>Source to Wedge Tray Distance	(300A, 00DA)	DS 1	3	Ignored

>Number of Compensators	(300A, 00E0)	IS 1	1	Must match number of items in Compensator Sequence (300A, 00E3). **(See Table 17, Status Code A902).** WARNING + Field Note entry if non-zero. See Note XI.
>Total Compensator Tray Factor	(300A, 00E2)	DS 1	3	Ignored. See Note XI
>Compensator Sequence	(300A, 00E3)	SQ 1	1C	
>>Compensator Number	(300A, 00E4)	IS 1	1C	
>>Material ID	(300A, 00E1)	SH 1	2C	
>>Compensator ID	(300A, 00E5)	SH 1	3	
>>Source to Compensator Tray Distance	(300A, 00E6)	DS 1	2C	
>>Compensator Rows	(300A, 00E7)	IS 1	1C	
>>Compensator Columns	(300A, 00E8)	IS 1	1C	
>>Compensator Pixel Spacing	(300A, 00E9)	DS 2	1C	
>>Compensator Position	(300A, 00EA)	DS 2	1C	
>>Compensator Transmission Data	(300A, 00EB)	DS 1-N	1C	
>>Compensator Thickness Data	(300A, 00EC)	DS 1-N	1C	
>Number of Boli	(300A, 00ED)	IS 1	1	Must match number of items in Referenced Bolus Sequence (300A, 00B0). **(See Table 17, Status Code A902).** WARNING + Field Note entry if non-zero. See Note XI
>Referenced Bolus Sequence	(300C, 00B0)	SQ 1	1C	Ignored. See Note XI
>>Referenced ROI Number	(3006, 0084)	IS 1	1C	
>Number of Blocks	(300A, 00F0)	IS 1	1	Must match number of items in Block Sequence (300A, 00F4). **(See Table 17, Status Code A902).** WARNING + Field Note entry if non-zero. See Note XII
>Total Block Tray Factor	(300A, 00F2)	DS 1	3	Ignored
>Block Sequence	(300A, 00F4)	SQ 1	1C	See Appendix C and Note XII.
>>Block Tray ID	(300A, 00F5)	SH 1	3	Interpreted as Shadow Tray ID for prescribed Field. Must be the same for all items in the Block Sequence. See Note XII. **(See Table 17, Status Codes C008, C009).**
>>Source to Block Tray Distance	(300A, 00F6)	DS 1	2C	Ignored. See Note XII
>>Block Type	(300A, 00F8)	CS 1	1C	To Field Note entry. See Note XII
>>Block Divergence	(300A, 00FA)	CS 1	2C	Ignored. See Note XII
>>Block Number	(300A, 00FC)	IS 1	1C	To Field Note entry. See Note XII
>>Block Name	(300A, 00FE)	LO 1	3	To Field Note entry. See Note XII
>>Material ID	(300A, 00E1)	SH 1	2C	Ignored. See Note XII
>>Block Thickness	(300A, 0100)	DS 1	2C	
>>Block Transmission	(300A, 0102)	DS 1	2C	
>>Block Number of Points	(300A, 0104)	IS 1	2C	
>>Block Data	(300A, 0106)	DS 2-2N	2C	

>Applicator Sequence	(300A, 0107)	SQ 1	3	Number of items must be 0 or 1 only. Must only be present if Radiation Type (300A, 00C6) is “ELECTRON”. See Appendix C and Note XIV. **(See Table 17, Status Codes A902,C00D).**
>>Applicator ID	(300A, 0108)	SH 1	1C	Interpreted as Accessory Fitment Code. See Note XIV. **(See Table 17, Status Code C00E).**
>>Applicator Type	(300A, 0109)	CS 1	1C	“ELECTRON_SQUARE”, “ELECTRON_RECT”, “ELECTRON_CIRC”, “ELECTRON_SHORT”, or “ELECTRON_OPEN” only. Mapped to Accessory Mount. Must be consistent with Field size. See Note XIV. **(See Table 17, Status Code C00E).**
>>Applicator Description	(300A, 010A)	LO 1	3	To Field Note entry. See Note XIV
>Final Cumulative Meterset Weight	(300A, 010E)	DS 1	1C	Used in conjunction with Beam Meterset (300A, 0086) for this Beam (from RT Fraction Scheme Module) to derive Prescribed Field MU. If Beam Meterset is not specified, Prescribed MU for new Field and its Control Points will be set UNPRESCRIBED. See Note VII, Note VIII and Note X.
>Number of Control Points	(300A, 0110)	IS 1	1	The number of items in the Control Point Sequence must match the Number of Control Points attribute (300A, 0110). Maximum number of control points is 250. Geometric parameters in sequence must be consistent with Beam Type (300A, 00C4). Sequence complexity must comply with product licensing restrictions. **(See Table 17, Status Codes A702, A902, C010, C012).**
>Control Point Sequence	(300A, 0111)	SQ 1	1	
>>Control Point Index	(300A, 0112)	IS 1	1C	Values must start from 0 and increase in steps of 1 only. **(See Table 17, Status Code A902).**
>>Cumulative Meterset Weight	(300A, 0134)	DS 1	2C	Treated as Type 1C. Used in conjunction with Beam Meterset (300A, 0086) for this Beam (from RT Fraction Scheme Module) to derive Control Point MU. If Beam Meterset is not specified, Prescribed MU for new Field and its Control Points will be set UNPRESCRIBED. See, Note VII, Note VIII and Note X. **(See Table 17, Status Code C013).**
>>Referenced Dose Reference Sequence	(300C, 0050)	SQ 1	3	
>>>Referenced Dose Reference Number	(300C, 0051)	IS 1	1C	If specified, must match a Dose Reference Number (300A, 0012) included in the RT Prescription Module. **(See Table 17, Status Code A903).**

>>>Cumulative Dose Reference Coefficient	(300A, 010C)	DS 1	2C	Used in conjunction with Beam Dose (300A, 0084) for this Beam (from RT Fraction Scheme Module) to derive the Field Dose Contribution from this new Field to the respective Dose Monitoring Point. If Beam Dose is not specified, Dose Contribution will be set to UNPRESCRIBED. See Note VII and Note X
>>Nominal Beam Energy	(300A, 0114)	DS 1	3	If specified, must match capability of the named Treatment Machine (300A, 00B2) when combined with the Radiation Type (300A, 00C6). Prescribed value will apply to whole of forthcoming segment. (See Note XVI) **(See Table 17, Status Code C005).** If Energy is to change at any time during Beam, it must be prescribed at ALL control points. **(See Table 17, Status Code C01A).** Mapping can be disabled by configuration. **(See Table 18 in Appendix C).**
>>Dose Rate Set	(300A, 0115)	DS 1	3	Nominal dose rate. Prescribed value will apply to whole of forthcoming segment. (See Note XVI)
>>Wedge Position Sequence	(300A, 0116)	SQ 1	3	If not specified, and if Number of Wedges (300A, 00D0) is 0, Wedge is assumed to be OUT. If Wedge Position is to change at any time during Beam, Wedge Position Sequence must be specified at EVERY Control Point. **(See Table 17, Status Code C00C).**
>>>Referenced Wedge Number	(300C, 00C0)	IS 1	1C	Must match Wedge Number (300A, 00D2) in Wedge Sequence (300A, 00D1) **(See Table 17, Status Code A902).**
>>>Wedge Position	(300A, 0118)	CS 1	1C	Wedge position (IN, OUT only) will apply to whole of forthcoming segment. (See Note XVI)
>>Beam Limiting Device Position Sequence	(300A, 011A)	SQ 1	1C	If present, must specify a complete set of BLD's for the Control Point (i.e. ASYMY and [ASYMX and/or MLCX]). Each Device Type may appear in the Sequence only once. **(See Table 17, Status Code C007).**
>>>RT Beam Limiting Device Type	(300A, 00B8)	CS 1	1C	"ASYMX", "ASYMY", "MLCX" only. Must match a RT Beam Limiting Device Type (300A, 00B8) in Beam Limiting Device Sequence (300A, 00B6). Each Device Type may appear in the Sequence only once. **(See Table 17, Status Code C006).**
>>>Leaf/Jaw Positions	(300A, 011C)	DS 2-2N	1C	N=1 (ASYMX, ASYMY) or N=40(MLCX). Only XRAY Beams may specify MLC leaf positions describing IRREGULAR shapes. **(See Table 17, Status Codes C006, C00F, C010, C019).**

>>Gantry Angle	(300A, 011E)	DS 1	1C	**(See Table 17, Status Code C010).**
>>Gantry Rotation Direction	(300A, 011F)	CS 1	1C	
>>Beam Limiting Device Angle	(300A, 0120)	DS 1	1C	Any resultant movement of collimator between Control Points CANNOT pass through 180 degrees. i.e. sweep is restricted to range 180-270-0-90-180 degrees. **(See Table 17, Status Codes, C010, C011).**
>>Beam Limiting Device Rotation Direction	(300A, 0121)	CS 1	1C	
>>Patient Support Angle	(300A, 0122)	DS 1	1C	CANNOT change during Control Point Sequence. See Note XIV. **(See Table 17, Status Codes C010, C011).**
>>Patient Support Rotation Direction	(300A, 0123)	CS 1	1C	
>>Table Top Eccentric Axis Distance	(300A, 0124)	DS 1	3	Ignored
>>Table Top Eccentric Angle	(300A, 0125)	DS 1	1C	CANNOT change during Control Point Sequence. See Note XIV. **(See Table 17, Status Codes C010, C011).**
>>Table Top Eccentric Rotation Direction	(300A, 0126)	CS 1	1C	
>>Table Top Vertical Position	(300A, 0128)	DS 1	2C	
>>Table Top Longitudinal Position	(300A, 0129)	DS 1	2C	
>>Table Top Lateral Position	(300A, 012A)	DS 1	2C	
>>Isocenter Position	(300A, 012C)	DS 3	2C	Ignored
>>Surface Entry Point	(300A, 012E)	DS 3	3	
>>Source to Surface Distance	(300A, 0130)	DS 1	3	If specified at the first control point then it is used for the Focus to Skin Distance (FSD) in the prescribed field. Values at any other control point will be ignored.

Note X Primary Meterset Resolution and Minimum Radiating Segment Meterset

Desktop has a Primary Meterset resolution of 0.1 MU. The Meterset value at any given Control Point will be ROUNDED according to the rules described in Section C.8.8.14.1 of the Dicom Standard PS 3.3.
Desktop has a Minimum Radiating Segment Meterset of 1.0 MU. After rounding, non-zero segment Meterset values must be 1.0 MU or greater, otherwise the storage request will be REJECTED. **(See Table 17, Status Code C014).**

Note XI Compensator and Bolus Data Ignored with WARNING

Desktop does not store Compensator or Bolus data as part of the prescription.
If either of the attributes Number Of Compensators (300A, 00E) or Number Of Boli (300A, 00ED) is non-zero, the storage request will be accepted but a status code WARNING ELEMENTS DISCARDED will be returned to the remote application .**(See Table 17, Status Code B006).**

Additionally a Field Note entry will be created for the corresponding Prescribed Field to alert the operator at treatment time.

Note XII Handling of Block Sequence

Desktop stores only a single Shadow Tray ID as part of its Field prescription. Other attributes in the Block Sequence are stored as text in a Field Note entry, corresponding to the Prescribed Field, to alert the operator at treatment time, and a status code WARNING ELEMENTS DISCARDED will be returned to the remote application. **(See Table 17, Status Code B006).**

If Block Tray ID (300A, 00F5) attributes in the Block Sequence are present, they must all have the same value otherwise the storage request will be REJECTED. **(See Table 17, Status Code C009).**

If the specified Block Tray ID (300A, 00F5) can be interpreted as a valid Desktop Shadow Tray ID then it will be used as the prescribed Shadow Tray ID for the Field, otherwise the storage request will be REJECTED. **(See Table 17, Status Code C008).**

Mapping of Shadow Tray ID can be disabled by configuration. **(See Table 18 in Appendix C).**

Note XIV Mapping of Applicator Data

Individual Desktop Electron Applicators are only valid for use at specific Field sizes. The Applicator Type attribute (300A, 0190) must be one of the supported types and must be consistent with the Field size specified in the first Control Point to define an Desktop Applicator valid for treatment. **(See Table 17, Status Code C00E).**

If the specified Applicator ID (300A, 0108) can be interpreted as a valid Desktop Accessory Fitment ID then it will be used as the prescribed value for the field, otherwise the storage request will be REJECTED. **(See Table 17, Status Code C00E).**

Additionally the Applicator ID (300A, 0108) and Applicator Description (300A, 010A) attributes will be entered into a Field Note for the corresponding prescribed Field.

Mapping of Applicator data can be disabled by configuration. **(See Table 18 in Appendix C).**

Note XIV Patient Support and Table Top Movements REJECTED

Any storage request that contains any Beam that requires any Table or PSS movement during the Control Point Sequence will be REJECTED. **(See Table 17, Status Code C011).**

Note XVI Behaviour of Machine Parameters Between Control Points

During Beam delivery, where the value of scalar geometric parameters is specified to change between successive control points, it is assumed that the intention is for the parameter value to change linearly with delivered dose.

Geometric rotation directions, Wedge Position (300A, 0118), Nominal Beam Energy (300A, 0114) and Dose Rate Set (300A, 0115) are treated differently. For these parameters, the values specified at a control point will be deemed to apply throughout the forthcoming Beam segment (i.e. until the next control point and irrespective of its value).

Note XVI Special Case handling of Simple Wedged Fields

To maximise interoperability across a range of 3rd party Dicom implementations, and to make optimal use of the motorised wedge feature on Elekta linacs, Desktop will prescribe simple static wedged fields for efficient delivery.

Desktop will recognise each of the following cases as a simple wedged field for the purposes of complexity checks and product licensing, and will use the minimum number of delivered Beam segments:
Applicable to Release 4.0 and 4.1

- 3 control points where only Wedge Position changes between 1st and 2nd segment, and effective delivered Meterset is prescribed for both segments.

- 3 control points where only Wedge Position changes, and effective delivered Meterset is zero in either segment (the redundant segment will be discarded and prescribed delivery will be a single segment)

- 4 control points where only Wedge Position changes between 1st and 3rd segments, and effective delivered Meterset is zero for 2nd segment (the redundant segment will be discarded and prescribed delivery will be in two segments).

Applicable to Release 4.1 only

- Fully wedged simple static or arc fields using 4 control points where :
  - the effective delivered Meterset is non-zero for one segment only.
  - The wedge position changes between the 1st and 3rd segments.
  - The wedge is IN for the radiating segment.
  - The two redundant segments will be discarded and the prescribed delivery will be a single segment.

Table 15 RT Plan Storage SOP Class (SCP) – Approval Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Approval Status	(300E, 0002)	CS 1	1	Logged to Dicom Plan Information record if present.
Review Date	(300E, 0004)	DA 1	2C	
Review Time	(300E, 0005)	TM 1	2C	
Reviewer Name	(300E, 0008)	PN 1	2C	

Table 16 RT Plan Storage SOP Class (SCP) – SOP Common Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
SOP Class UID	(0008, 0016)	UI 1	1	1.840.10008.5.1.4.1.1.481.5 only
SOP Instance UID	(0008, 0018)	UI 1	1	Logged to Dicom Plan Information record if present.
Specific Character Set	(0008, 0005)	CS 1-N	1C	Ignored
Instance Creation Date	(0008, 0012)	DA 1	3	Logged to Dicom Plan Information record if present.
Instance Creation Time	(0008, 0013)	TM 1	3	
Instance Creator UID	(0008, 0014)	UI 1	3	

APPENDIX B C-STORE Response Status Codes

Table 17 below lists the specific status code values returned by Desktop in a C-STORE response.
Notes. Desktop can be configured to suppress warnings, namely to treat a warning as a success.
A C_STORE request with status code WARNING will have succeeded in transferring the information to the Desktop patient database. This is not dependent on whether or not warnings are configured to be suppressed.

Table 17 C-STORE Status Codes

Service Status	Further Meaning	Status Code Values	Notes
Refused	Out of Resources	A7xx	
	- Patient locked	A701	See Table 5
	- Feature not licensed	A702	See Table 14
Error	Data Set does not match SOP Class	A9xx	
	- Invalid Dicom message	A901	See Section A.1
	- Invalid Beam Sequence	A902	See Table 14
	- Invalid Dose Reference Sequence	A903	See Table 10
	- Invalid Tolerance Table Sequence	A904	See Table 11
	- Invalid Patient Setup Sequence	A905	See Table 12
	- Invalid Fraction Group Sequence	A906	See Table 13
Error	Cannot Understand	Cxxx	
	- Missing Patient Identification data	C001	See Note I
	- Inconsistent Patient data	C002	See Note III
	- Missing Treatment Machine Name	C003	See Table 14
	- Unrecognised Linac	C004	See Table 14
	- Invalid Linac Energy or Radiation Type	C005	See Table 14
	- Invalid Beam Limiting Device	C006	See Table 14
	- Incomplete Beam Limiting Device combination	C007	See Table 14
	- Unrecognised Block Tray ID	C008	See Note XII
	- Inconsistent Block Tray ID	C009	See Note XII
	- Unsupported Dosimeter Unit	C00A	See Table 14
	- Unsupported Wedge	C00B	See Table 14
	- Under-specified Wedge Position Sequence	C00C	See Table 14
	- Applicator specified with X-rays	C00D	See Table 14
	- Unsupported Applicator	C00E	See Note XIV
	- MLC shape specified with Electrons	C00F	See Table 14
	- Geometric parameter out of customised range	C010	See Table 14
	- Unsupported machine movements	C011	See Table 14
	- Beam too complex	C012	See Table 14
	- Missing Cumulative Meterset Weight	C013	See Table 14
	- Segment Meterset too small	C014	See Note X
	- Plan contains Brachy data	C015	See Table 13
	- Unsupported Treatment Delivery Type	C016	See Table 14
	- Unsupported Fraction Dosimetry	C017	See Table 13
	- Inconsistent Tolerance Table data	C018	See Table 11
	- Invalid MLC Shape or Leaf Positions	C019	See Table 14
	- Under-specified Energy changes	C01A	See Table 14
Warning	Coercion of Data Elements	B000	
Warning	Data Set does not match SOP Class	B007	
Warning	Elements Discarded	B006	
	- Compensator data ignored		See Note XI
	- Bolus data ignored		See Note XI
	- Block data ignored		See Note XII
	- Tolerance Table data ignored		See Note VI
	- Attribute ignored – Disabled by Configuration		See Appendix C
	- Parameter movements inconsistent with Beam Type		
Success		0000	

APPENDIX C Configurable AE-Specific Attribute Mapping to Desktop Database

Certain attributes in the Dicom RT Plan IOD do not map exactly to Desktop database parameters, but where Desktop constraints are satisfied, a useful default mapping can be defined. These constraints and mappings are identified in Appendix A.

In some situations, it may not be possible for an Desktop constraint to be met, or a defined default mapping may be considered inappropriate in a particular clinical environment. To maximise interoperability with a range of Dicom implementations, Desktop has an Attribute Mask which can be configured to explicitly **disable** the mapping of certain attributes from an applied RT Plan IOD into the Desktop database **on a per-Application Entity basis**.

Table 18 below lists the Dicom attributes that may be masked from mapping. Masking an attribute will override the constraints and mappings defined in Appendix A, and cause the corresponding Desktop database parameters to be left UNPRESCRIBED. It will then be necessary for the operator of Desktop to specify a valid value for the parameter before the prescription becomes valid for treatment.

A C-STORE response status of WARNING – ELEMENTS DISCARDED will be returned by Desktop when data in a C-STORE request is ignored due to configuration.

Table 18 Configurable Attribute Mappings per AE

Flag	Attributes Affected	Notes
Mask Mapping of Tolerance Tables	Tolerance Table Sequence (300A, 0040) and Referenced Tolerance Table (300C, 00A0)	See Note VI. If set, no Tolerance Tables will be imported into Desktop and Prescribed Fields will have UNPRESCRIBED but MANDATORY Tolerance Tables.
Mask Mapping of Shadow Tray ID	Block Sequence (300A, 00F4) and Block Tray ID (300A, 00F5) for XRays	See Note XII. If set, Desktop Shadow Tray ID will be left UNPRESCRIBED but MANDATORY if Block Sequence is present in applied IOD when creating XRay Fields.
Mask Mapping of Accessory Fitment	Applicator Sequence (300A, 0107) and Applicator ID (300A, 0108), for Electrons	See Note XIV. If set, Desktop Accessory Fitment will be left UNPRESCRIBED but MANDATORY when creating Electron Fields.
Mask Mapping of Accessory Mount	Applicator Sequence (300A, 0107) and Applicator Type (300A, 0109) for Electrons	See Note XIV. If set, Desktop Accessory Mount will be left UNPRESCRIBED but MANDATORY when creating Electron Fields.
Mask Mapping of Energy	Nominal Beam Energy (300A, 0114) Treatment Machine Name (300A, 00B2) and Radiation Type (300A, 00C6)	See Table 14. If set, Desktop Energy will be left UNPRESCRIBED but MANDATORY when creating Prescribed Fields.