RTPConnect

Interface Specification

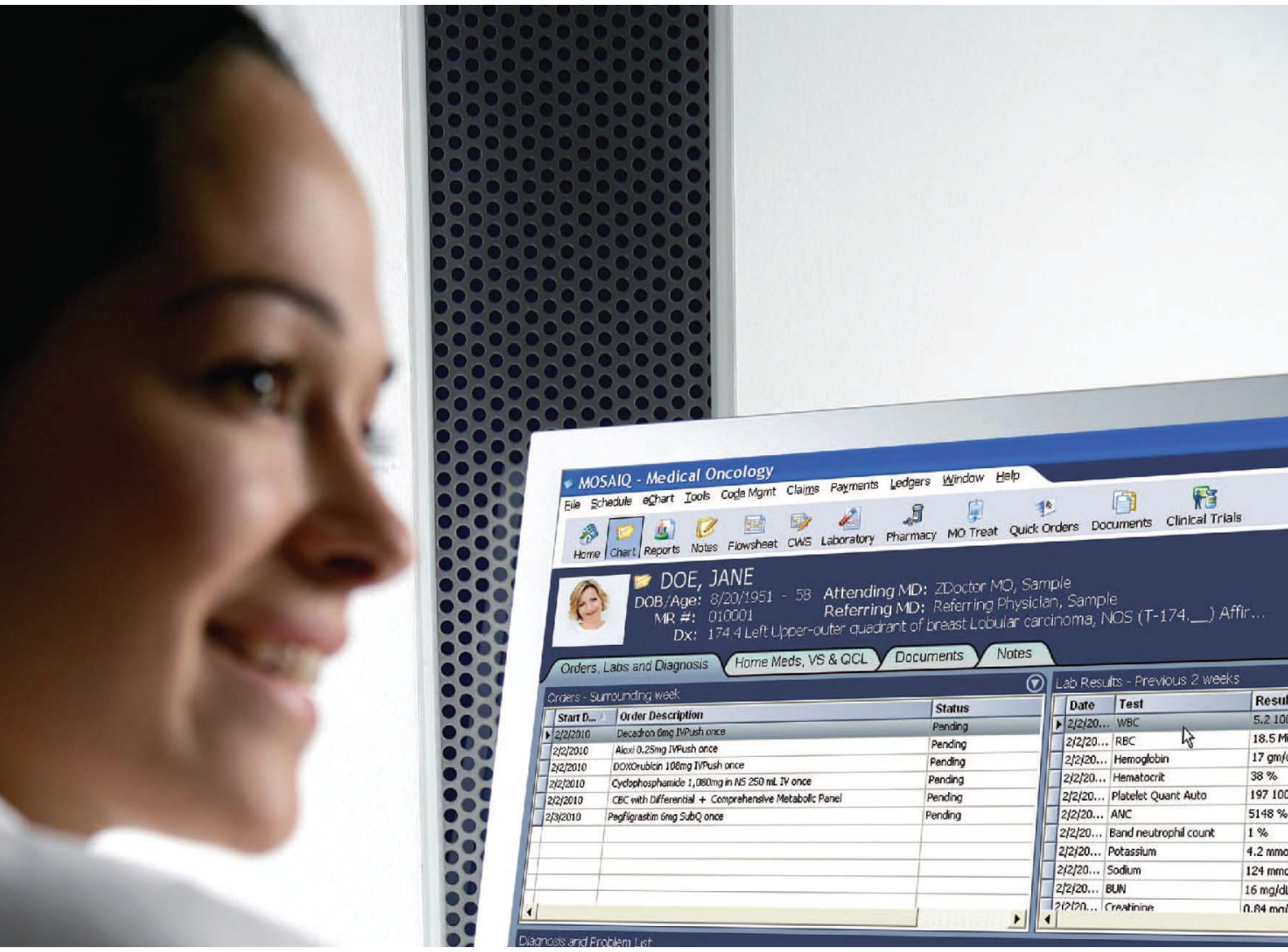

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Table of Contents

1. Introduction 6
1.1 Purpose 6
1.2 Scope 6
1.3 References 6
1.4 Document Conventions 6
1.5 What's Changed 6
1.6 Assumptions & Constraints 6

2. Record Structure and Keyword Definitions 8
2.1 Treatment Definition Hierarchy 8
2.2 Plan Definition Record [PLAN_DEF] 10
2.3 EXTENDED PLAN DEFINITION Record [EXTENDED_PLAN_DEF] 10
2.4 Prescription Site Record [RX_DEF] 11
2.5 Site Setup Record [SITE_SETUP_DEF] 11
2.6 Simulation Field Record [SIM_DEF] 11
2.7 Treatment Field Record [FIELD_DEF] 12
2.8 EXTENDED Treatment Field Record [EXTENDED_FIELD_DEF] 13
2.9 Document based Treatment Field Record [PDF_FIELD_DEF] 14
2.10 MultiLeaf Collimator Record [MLC_DEF] 15
2.11 Control Point Record [CONTROL_PT_DEF] 15
2.12 MLC Shape Record [MLC_SHAPE_DEF] 17
2.13 Dose Tracking Record [DOSE_DEF] 18
2.14 Dose Action Points [DOSE_ACTION] 18

3. File structure 20
3.1 File Layout 20
3.2 Minimum Record Content 20
3.3 Data Formatting Rules 20
3.3.1 Numeric Elements 20
3.3.2 Alphanumeric Elements 21
3.3.3 Date Elements 21
3.3.4 Time Elements 21

4. DATA ITEM DEFINITION 22

Appendix A: cyclical redundancy check (CRC) Rules 32

Appendix B: SAMPLE IMPORT Validation Rules 34

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1. Introduction

1.1 Purpose

This document specifies the data items and formatting rules used to create an ASCII file to transfer information between a radiotherapy treatment management (RTM) system and a radiotherapy treatment planning (RTP) system. Data may be imported or exported from an RTM system or RTP system using this interface definition.

1.2 Scope

This document is limited to the definition of the data file at an application level. It does not attempt to define the physical transfer mechanism of the file or the operation of the respective import/export programs on the RTM or RTP side. Vendors are encouraged to maintain an RTP Import/Export protocol Conformance Statement describing the level of support for the protocol and other version-specific implementation details. A subset of representative import validation rules for an RTM system is specified in Appendix B: SAMPLE IMPORT Validation Rules.

1.3 References

- MS-DOS 6.0 Technical Reference.
- RTP*Connect* Conformance Statement. The version-specific Conformance Statement must be referenced together with this document to completely define the RTP*Connect* interface.

1.4 Document Conventions

Actual file data elements are shown in Courier font, e.g., `Rx_Site_Name`.

1.5 What's Changed

1. Added the following to `EXTENDED_FIELD_DEF` below Section 2.8 and Section 0 - Data Item Definition.
   1.1. Treatment_High Dose Authorization
2. Added new section for `EXTENDED_PLAN_DEF` record.

1.6 Assumptions & Constraints

The RTP system must be capable of generating an MS-DOS 6.0 ASCII file. The file must conform to the 8.3 naming convention.

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2. Record Structure and Keyword Definitions

2.1 Treatment Definition Hierarchy

As defined by the American College of Surgeons Commission on Cancer, the first ***course*** of therapy is restricted to any and all procedures or treatments administered during or after the first clinical diagnosis of the cancer. Further, if a recurrence or a new cancer is diagnosed after the completion of a previous treatment, or if there is a change to a course of therapy due to the apparent failure of the originally planned and administered therapy, then a new course of therapy should be recorded for the patient. Using this definition of a treatment course as a basis, only one plan may be defined for each treatment course. However, it is not uncommon for oncologists to prescribe treatments to multiple sites in the same course. A patient may have the tumor volume treated, then the lymph system—at different locations. These sites will most likely have different treatment techniques employed and quite different field definitions.

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These variations in treatment planning definitions are accommodated using the system of plan definition described below. This specification defines a treatment plan (course) with multiple treatment (prescription) sites, and multiple treatment fields. Figure 1 below illustrates the treatment planning data hierarchy.

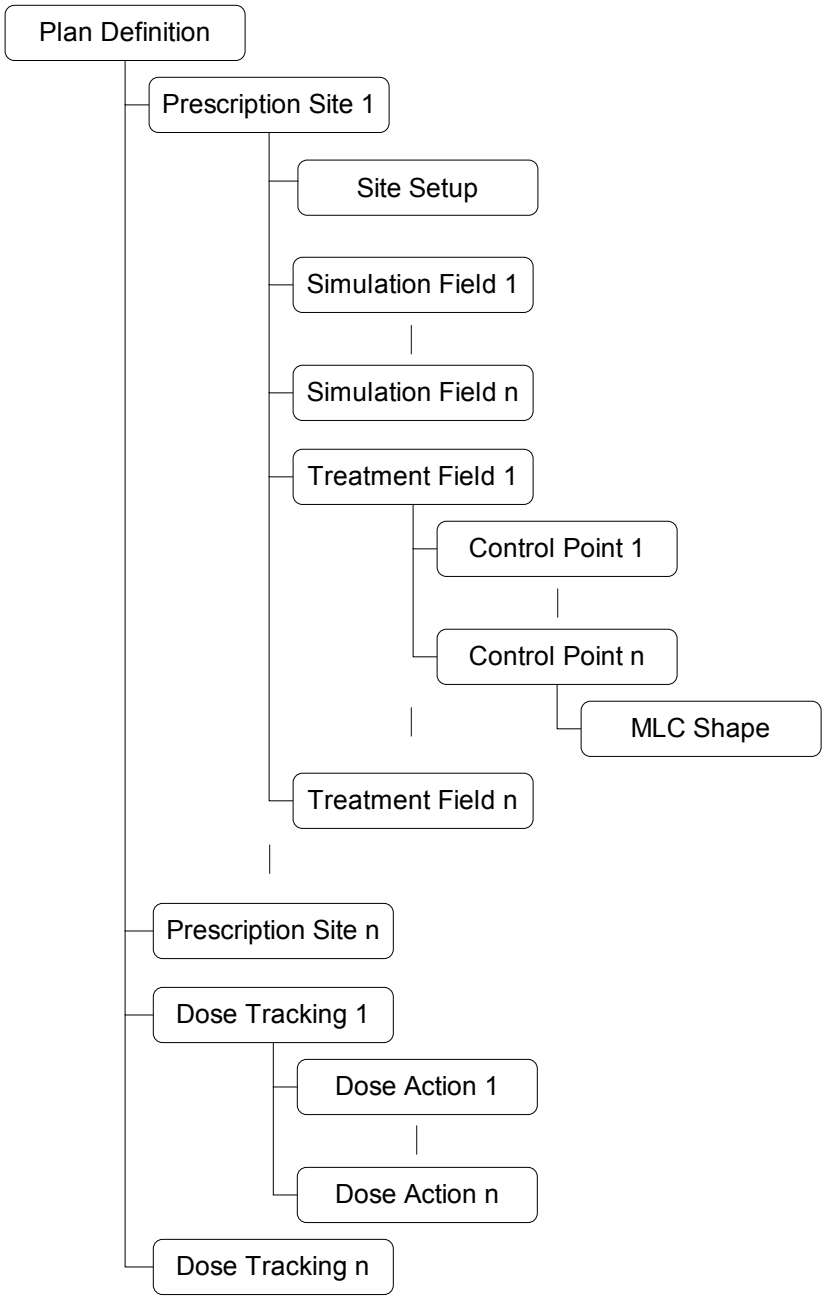

Figure 1: RTP Import/Export Data Hierarchy

The following sections describe the records of the data file that correspond to the structure illustrated above. The *KEYWORDS,* their data elements, and the order in which their data elements must appear in the particular record are specified. The individual data items and the file construction rules are specified in a later section. Data elements shown with an asterisk (*) are required elements.

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2.2 Plan Definition Record [PLAN_DEF]

The keyword PLAN_DEF identifies the record that contains the treatment plan identifiers for the patient, the plan, and the staff member who generated the plan. The PLAN_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Patient_ID *
3. Patient_Last_Name
4. Patient_First_Name
5. Patient_MInitial
6. Plan_ID
7. Plan_Date
8. Plan_Time
9. Course_ID *
10. Diagnosis
11. MD_Last_Name
12. MD_First_Name
13. MD_MInitial
14. MD_Approve_LName
15. MD_Approve_FName
16. MD_Approve_MInitial
17. Phy_Approve_LName
18. Phy_Approve_FName
19. Phy_Approve_MInitial
20. Author_Last_Name
21. Author_First_Name
22. Author_MInitial
23. RTP_Mfg
24. RTP_Model
25. RTP_Version
26. RTP_IF_Protocol
27. RTP_IF_Version
28. CRC *

RTP_Mfg, RTP_Model and RTP_Version should identify the radiotherapy treatment planning (RTP) vendor product used to create the data file. Though not required, IMPAC strongly recommends that vendors populate these elements with the respective information so that the origin of a given RTP file is documented within.

2.3 EXTENDED PLAN DEFINITION Record [EXTENDED_PLAN_DEF]

The keyword EXTENDED_PLAN_DEF identifies the optional record that contains the full original DICOM Patient Name and encoding technique information. The Extended Plan Definition record fields are stored in "keyword=value" format. The EXTENDED_PLAN_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Encoding
3. Fullname
4. CRC *

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2.4 Prescription Site Record [RX_DEF]

The keyword RX_DEF identifies the record that contains prescription site and treatment technique information. The RX_DEF record contains the following data elements in the order that follows:

```
1. Keyword *
2. Course_ID *
3. Rx_Site_Name *
4. Technique
5. Modality
6. Dose_Spec
7. Rx_Depth
8. Dose_TTL
9. Dose_Tx
10. Pattern
11. Rx_Note
12. Number_of_Fields
13. CRC *
```

2.5 Site Setup Record [SITE_SETUP_DEF]

The keyword SITE_SETUP_DEF identifies the record that contains the site setup information for the prescription site. The SITE_SETUP_DEF record contains the following data elements in the order that follows:

```
1. Keyword *
2. Rx_Site_Name *
3. Patient_Orientation
4. Treatment_Machine
5. Tolerance_Table
6. Isocenter_Position_X
7. Isocenter_Position_Y
8. Isocenter_Position_Z
9. Structure_Set_UID
10. Frame_Of_Reference_UID
11. Couch_Vertical
12. Couch_Lateral
13. Couch_Longitudinal
14. Couch_Angle
15. Couch_Pedestal
16. Table_Top_Vert_Displacement
17. Table_Top_Long_Displacement
18. Table_Top_Lat_Displacement
19. CRC *
```

2.6 Simulation Field Record [SIM_DEF]

The keyword SIM_DEF identifies the records that contain simulation field information. The SIM_DEF record contains the following data elements in the order that follows:

```
1.  Keyword *
2.  Rx_Site_Name
3.  Field_Name
4.  Field_ID *
5.  Field_Note
6.  Treatment_Machine
7.  Gantry_Angle
8.  Collimator_Angle
9.  Field_X_Mode
```


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10. Field_X
11. Collimator_X1
12. Collimator_X2
13. Field_Y_Mode
14. Field_Y
15. Collimator_Y1
16. Collimator_Y2
17. Couch_Vertical
18. Couch_Lateral
19. Couch_Longitudinal
20. Couch_Angle
21. Couch_Pedestal
22. SAD
23. AP_Separation
24. PA_Separation
25. Lateral_Separation
26. Tangential_Separation
27. Other_Label_1
28. SSD_1
29. SFD_1
30. Other_Label_2
31. Other_Measurement_1
32. Other_Measurement_2
33. Other_Label_3
34. Other_Measurement_3
35. Other_Measurement_4
36. Other_Label_4
37. Other_Measurement_5 (reserved for future use)
38. Other_Measurement_6 (reserved for future use)
39. Blade_x_mode
40. Blade_x
41. Blade_x1
42. Blade_x2
43. Blade_y_mode
44. Blade_y
45. Blade_y1
46. Blade_y2
47. II_Lateral
48. II_Longitudinal
49. II_Vertical
50. KVP
51. MA
52. Seconds
53. CRC *

2.7 Treatment Field Record [FIELD_DEF]

The keyword FIELD_DEF identifies the records that contain treatment field information. The FIELD_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Rx_Site_Name
3. Field_Name
4. Field_ID *
5. Field_Note
6. Field_Dose

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7. Field_Monitor_Units
8. Wedge_Monitor_Units
9. Treatment_Machine
10. Treatment_Type
11. Modality
12. Energy
13. Time
14. Doserate
15. SAD
16. SSD
17. Gantry_Angle
18. Collimator_Angle
19. Field_X_Mode
20. Field_X
21. Collimator_X1
22. Collimator_X2
23. Field_Y_Mode
24. Field_Y
25. Collimator_Y1
26. Collimator_Y2
27. Couch_Vertical
28. Couch_Lateral
29. Couch_Longitudinal
30. Couch_Angle
31. Couch_Pedestal
32. Tolerance_Table
33. Arc_Direction
34. Arc_Start_Angle
35. Arc_Stop_Angle
36. Arc_MU_Degree
37. Wedge
38. Dynamic_Wedge
39. Block
40. Compensator
41. e_Applicator
42. e_Field_Def_Aperture
43. Bolus
44. Portfilm_MU_Open
45. Portfilm_Coeff_Open
46. Portfilm_Delta_Open
47. Portfilm_MU_Treat
48. Portfilm_Coeff_Treat
49. CRC *

2.8 EXTENDED Treatment Field Record [EXTENDED_FIELD_DEF]

The keyword EXTENDED_FIELD_DEF identifies the records that contain additional treatment field information. The EXTENDED_FIELD_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Field_ID *
3. Original_Plan_UID
4. Original_Beam_Number
5. Original_Beam_Name
6. IsFFF
7. Accessory_Code

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8. Accessory_Type
9. High_Dose_Authorization
10. CRC *

2.9 Document based Treatment Field Record [PDF_FIELD_DEF]

The keyword PDF_FIELD_DEF identifies the records that contain document based treatment field information. The PDF_FIELD_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Rx_Site_Name
3. Field_Name
4. Field_ID *
5. Field_Note
6. Field_Dose
7. Primary_Dosimeter_Units
8. Meterset
9. Treatment_Machine
10. Treatment_Type
11. Modality
12. Energy
13. Time
14. Doserate
15. SAD
16. SSD
17. Gantry_Angle
18. Collimator_Angle
19. Field_X_Mode
20. Field_X
21. Collimator_X1
22. Collimator_X2
23. Field_Y_Mode
24. Field_Y
25. Collimator_Y1
26. Collimator_Y2
27. Couch_Vertical
28. Couch_Lateral
29. Couch_Longitudinal
30. Couch_Angle
31. Couch_Pedestal
32. Tolerance_Table
33. Arc_Direction
34. Arc_Start_Angle
35. Arc_Stop_Angle
36. Arc_MU_Degree
37. Wedge
38. Dynamic_Wedge
39. Block
40. Compensator
41. e_Applicator
42. e_Field_Def_Aperture
43. Bolus
44. Portfilm_MU_Open
45. Portfilm_Coeff_Open
46. Portfilm_Delta_Open
47. Portfilm_MU_Treat

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48. Portfilm_Coeff_Treat
49. Original_Plan_UID
50. Original_Beam_Number
51. Original_Beam_Name
52. CRC *

2.10 MultiLeaf Collimator Record [MLC_DEF]

The keyword MLC_DEF identifies the record that contains the MLC leaf positions for a treatment field. The MLC_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Field_ID *
3. MLC_Type *
4. MLC_Leaves *
5. MLC_LP$_1$ (A_1)
   :
54. MLC_LP$_{50}$ (A_{50})
55. MLC_LP$_{51}$ (B_1)
   :
104. MLC_LP$_{100}$ (B_{50})
105. CRC *

For MLCs with greater than 50 leaves per side, or for IMRT treatments, it is required that the Control Point Record be used instead of the Multileaf Collimator Record.

2.11 Control Point Record [CONTROL_PT_DEF]

The keyword CONTROL_PT_DEF identifies the record that contains the geometric and monitor unit parameters for large leaf count MLCs (i.e. greater than 50 leaves/side) and IMRT (step and shoot and dynamic) applications. The CONTROL_PT_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Field_ID *
3. MLC_Type *
4. MLC_Leaves *
5. Total_Control_Points *
6. Control_Pt_Number
7. MU_Convention
8. Monitor_Units
9. Wedge_Position
10. Energy
11. Doserate
12. SSD
13. Scale_Convention *
14. Gantry_Angle
15. Gantry_Dir
16. Collimator_Angle
17. Collimator_Dir
18. Field_X_Mode
19. Field_X
20. Collimator_X1
21. Collimator_X2
22. Field_Y_Mode
23. Field_Y

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24. Collimator_Y1
25. Collimator_Y2
26. Couch_Vertical
27. Couch_Lateral
28. Couch_Longitudinal
29. Couch_Angle
30. Couch_Dir
31. Couch_Pedestal
32. Couch_Ped_Dir
33. MLC_LP$_1$ (A_1)
    :
132. MLC_LP$_{100}$ (A_{100})
133. MLC_LP$_{101}$ (B_1)
    :
232. MLC_LP$_{200}$ (B_{100})
233. CRC *

NOTES:

- If Control Point records are utilized in a field definition, then the geometric parameters contained in the corresponding FIELD_DEF record are superceded by the values in the Control Point zero record. Monitor_Units of FIELD_DEF must match the value (properly scaled) in the last Control Point.
- Total_Control_Pts: This element specifies the total number of control points that will be used (i.e., total number of CONTROL_PT_DEF records for a given FIELD_DEF record). An IMRT field is indicated by specifying a value >1. An IMRT field must have FIELD_DEF:Treatment_Type of 'DMLC', 'StepNShoot', 'VMAT' or 'Dynamic'.
  - **SPECIAL CASE:** If Total_Control_Pts =1, then only the required data elements and the MLC parameter elements of the Control Point record are utilized. All of the other elements shall be NULL.
- Control_Pt_Number: This element is used to identify a given control point within a set of Total_Control_Pts. The RTP system must define the treatment order of the control points. For IMRT fields, the first control point is numbered zero. Each subsequent control point record is incremented by one.
- MU_Convention: This element details how Monitor Units are specified in the subsequent Monitor_Units element.
  - A value of one (1) in this element indicates that the Monitor_Units element contains the cumulative fraction of the total MU to be delivered, up to and including this control point. Any value between 0.000000-1.000000, inclusive, is valid. The first control point value must equal 0.000000, and the last control point value must equal 1.000000. Sequential control points may have the same MU value to indicate geometric movement without radiation.
  - A value of two (2) in this element indicates that the Monitor_Units element contains the absolute value of centi-Monitor Units to be delivered, up to and including this control point (i.e., cumulative). Any value between 0-999999, inclusive, is valid. The first control point value must equal 0. If the final control point value does not equal FIELD_DEF:Field_Monitor_Units (x100), the value in the control point shall take precedence. Sequential control points may have the same MU value to indicate geometric movement without radiation.

  Please note that the MU may need to be computed to a resolution different from that specified in a Control Point record, in order to be utilized on a particular treatment unit.

  - The Scale_Convention element indicates whether the geometric parameters are represented in the target machine's native readout format (1), or in the IEC 1217 convention (2). The Scale_Convention

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must be the same for all control points for a given a Field. The Scale_Convention in the control points also applies to the geometric parameters in the FIELD_DEF record.

- For rotation angles, the rotation direction is specified as “CW”, “CCW” or NULL for none. The rotation direction for a parameter must be NULL in a Control Point record if the parameter value does not change from this control point to the next. All rotation directions must be NULL in the last Control Point record.
- All geometric treatment parameters except couch are specified in absolute machine coordinates. For couch geometric parameters, if the first control point contains a NULL value, then all subsequent control point values for that particular parameter are specified relative to the initial value; otherwise, the position shall be interpreted as absolute. If relative values are used for a couch parameter, the initial value used for verification shall be the value in FIELD_DEF.
- With the exception of couch parameters as noted above, all geometric parameters must be specified in control point 0 for multiple control point fields. Parameters that change at any control point of the field shall be explicitly specified in all control point records, including those preceding the change. Parameters that do not change at any control point of the field may be specified in control point 0 and be NULL in remaining control points.
- The Field_ID is used to associate the control points with the treatment field (FIELD_DEF). The limit on the number of control points associated with a treatment field in this specification is 999. There may be a different limitation for the receiving treatment unit.

2.12 MLC Shape Record [MLC_SHAPE_DEF]

The keyword MLC_SHAPE_DEF identifies the records which define the shape associated with an MLC record. The MLC_SHAPE_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Field_ID *
3. Control_Pt_Number *
4. Total_Shape_Points *
5. $X_Coordinate_1$
6. $Y_Coordinate_1$

:

323. $X_Coordinate_{160}$
324. $Y_Coordinate_{160}$
325. CRC *

NOTES:

- Control_Pt_Number: This element is used to link the MLC “shape” (field outline) to a specific control point defined in the Control Point record [CONTROL_PT_DEF]. For non-Control Point MLC fields (i.e., those that use the MLC_DEF record), this element must be NULL.
- Total_Shape_Points: This element is used to indicate the total number of coordinate points (x, y) that define a given shape.
- X_Coordinate and Y_Coordinate shall be specified in centimeters in relation to isocenter. Isocenter is referenced as 0. The following diagram is oriented as a beam’s eye view, with the collimator angle in its origin position (i.e. 0 degrees IEC). The maximum number of x and y coordinate pairs is 160. Fewer than the maximum coordinate pairs may be used—any remaining unused points should be NULL.

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2.13 Dose Tracking Record [DOSE_DEF]

The keyword DOSE_DEF identifies the records that contain the primary and secondary site information for dose tracking purposes. If the Region_Name matches exactly a prescription site name, then the dose tracking shall be set as a primary (prescription) site; otherwise, it shall be set as a secondary (non-prescription) site. Up to ten fields can contribute dose to a particular site, as specified by the Field_ID/Reg_Coeff pairs. The Reg_Coeff is multiplied by the Field_Dose for each pair and all of the products are summed to determine the amount of dose contributed to a particular site.

The DOSE_DEF record contains the following data elements in the order that follows:

1. Keyword *
2. Region_Name *
3. Region_Prior_Dose
4. $Field_ID_1$ *
5. Reg_Coeff_1*
   :
22. $Field_ID_{10}$
23. Reg_Coeff_{10}
24. Actual_Dose
25. Actual_Fractions
26. CRC *

NOTES:

Multiple DOSE_DEF records for the same Region may be included in the same file if more than ten coefficients are needed. The value of the Region_Prior_Dose in the last DOSE_DEF record for a Region_Name will supercede the values in earlier records for that Region_Name.

2.14 Dose Action Points [DOSE_ACTION]

The keyword DOSE_ACTION identifies the records that contain Dose Action Points that are used to generate dose related treatment actions for the defined sites. The DOSE_ACTION record contains the following data elements in the order that follows:

1. Keyword *
2. Region_Name *
3. Action_Dose *
4. Action_Note
5. CRC *

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3. File structure

3.1 File Layout

- The RTP import/export files can have any valid DOS filename and extension. It is recommended that all files containing treatment planning data have the same filename extension (e.g., IMPORT1.RTP, IMPORT2.RTP, etc.) to facilitate batch importing/exporting.
- The RTP Import/Export files shall conform to standard DOS (i.e., Microsoft DOS 6.0) comma delimited ASCII text files.
- All data elements shall be passed as strings, contained in double quotes.
- There must not be any spaces between the quote-comma-quote (",") sequence separating successive data items.
- The end of a DOS ASCII file is marked with a Ctrl-Z character (ASCII Code 26).
- A NULL data item is represented by two successive quotes, e.g., "`data_item_n-1`","","`data_item_n+1`".
- Successive records are delimited by a carriage return/line feed (ASCII Codes 13/10), or a line feed/carriage return (ASCII Codes 10/13).
- The last field of each record shall be the calculated CRC for all of the preceding fields in that record, including quotations and commas. See Appendix A for CRC calculation information.
- The records in the DOS ASCII file shall be ordered as specified in section 2 above, specifically: `PLAN_DEF, EXTENDED_PLAN_DEF, RX_DEF, SITE_SETUP_DEF, SIM_DEF, FIELD_DEF or PDF_FIELD_DEF, EXTENDED_FIELD_DEF, MLC_DEF, CONTROL_PT_DEF, MLC_SHAPE_DEF, DOSE_DEF, DOSE_ACTION`.

3.2 Minimum Record Content

- Record content and length are variable. The first element of each record shall begin with a ***keyword*** to identify the contents of the record. Keywords indicate the order of elements that follow and the data type for each element. Keywords are case insensitive.
- The first record in each file shall be the `PLAN_DEF` record.
- A file shall contain one and only one `PLAN_DEF` record, i.e., only one patient per file.
- The structure of each record must conform **exactly** to the structure identified in Section 2 of this document. Data element labels **shall not** be included in the record data.
- Element data shall conform to the formats shown in the table in Section 4.

3.3 Data Formatting Rules

The following sections describe the data formatting rules for numeric, string, date, and time data elements.

3.3.1 Numeric Elements

- Data of numeric type may only contain numbers, decimal points and the + or - signs. Commas, percentage signs and/or alpha characters are not permitted. Negative numbers must have a minus (-) sign preceding the number. Numbers are assumed to be positive if no sign is specified.
- Each numeric data element shall have a specific format, as shown in the Data Format column of the Section 4 table.
- It is not necessary to add leading or trailing zeros to conform to the format definition, e.g., “3.42” is acceptable for data type `nn.nn`.

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- It is not necessary to append a decimal point or decimal place values if the fractional portion of an element is zero.
- NULL numeric data items shall be initialized to zero upon import.
- All numbers related to field size use isocenter as the reference point.

3.3.2 Alphanumeric Elements

- Data of alphanumeric type may contain any ASCII character between ' ' (SPACE, 20h) and '~' (TILDE, 7Eh) and also Extended ASCII characters between '€' (EURO SIGN, 80h) and 'ÿ' (LATIN SMALL LETTER y WITH DIAERESIS, FFh).
- Data items requiring alphanumeric data formats are shown as S(n), where S implies it is string type data and n indicates maximum length (e.g., S(20) implies an alphanumeric format of maximum length 20).
- It is not necessary to add leading or trailing spaces or other characters to match the maximum string length.
- NULL string data items shall remain NULL upon import.

3.3.3 Date Elements

Date information shall be presented as the concatenation of the year, month and day (format yyyymmdd). All characters shall be numbers; e.g., August 3, 1994 shall be shown as 19940803, 2 January 1995 shall be shown as 19950102.

3.3.4 Time Elements

Time information shall be presented as the concatenation of hours, minutes and seconds using a 24-hour clock as a convention (format hhmmss). All characters shall be numbers; e.g., 2:10 PM shall be shown as 141000, 8:15 and 30 seconds AM shall be shown as 081530.

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4. DATA ITEM DEFINITION

The items in the following table indicate which data may be imported/exported from an RTP system to an RTM system. Required data elements for each record are shown in Section 2, marked with asterisks. Data elements contained within curly brackets {} in the *Notes* column represent the only valid selections for that particular data item.

RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
N/A	KEYWORD	S(20)				Required	Record Identifier, case insensitive
PLAN_DEF	Patient_ID	S(20)				Required	Patient's Primary ID Number
PLAN_DEF	Patient_Last_Name	S(40)				Optional	Patient's Last Name
PLAN_DEF	Patient_First_Name	S(40)				Optional	Patient's First Name
PLAN_DEF	Patient_MInitial	S(1)				Optional	Patient's Middle Initial
PLAN_DEF	Plan_ID	S(15)				Optional	ID of Treatment Plan
PLAN_DEF	Plan_Date	yyyymmdd		19900101	20991231	Optional	Date Plan Approved
PLAN_DEF	Plan_Time	hhmmss		000000	235959	Optional	Time Plan Approved
PLAN_DEF RX_DEF	Course_ID	nn		1	99	Required	Course ID Number
PLAN_DEF	Diagnosis	S(20)				Optional	Diagnosis category, e.g., Breast, Lung, Prostate
PLAN_DEF	MD_Last_Name	S(40)				Optional	Last name of patient's radiation oncologist.
PLAN_DEF	MD_First_Name	S(40)				Optional	First name of patient's radiation oncologist.
PLAN_DEF	MD_MInitial	S(1)				Optional	Middle initial of patient's radiation oncologist
PLAN_DEF	MD_Approve_LName	S(20)				Optional	Last name of radiation oncologist who approved plan.
PLAN_DEF	MD_Approve_FName	S(20)				Optional	First name of radiation oncologist who approved plan.
PLAN_DEF	MD_Approve_MInitial	S(1)				Optional	Middle initials of radiation oncologist who approved plan
PLAN_DEF	Phy_Approve_LName	S(20)				Optional	Last name of radiation physicist who approved plan.
PLAN_DEF	Phy_Approve_FName	S(20)				Optional	First name of radiation physicist who approved plan.
PLAN_DEF	Phy_Approve_MInitial	S(1)				Optional	Middle initials of radiation physicist who approved plan.
PLAN_DEF	Author_Last_Name	S(40)				Optional	Last name of staff who generated/edited plan
PLAN_DEF	Author_First_Name	S(40)				Optional	First name of staff who generated/edited plan

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
PLAN_DEF	Author_MInitial	S(1)				Optional	Middle initials of staff who generated/edited plan
PLAN_DEF	RTP_Mfg	S(20)				Optional	RTP Manufacturer Name
PLAN_DEF	RTP_Model	S(20)				Optional	RTP Product Name
PLAN_DEF	RTP_Version	S(10)				Optional	RTP Software Version Number
PLAN_DEF	RTP_IF_Protocol	S(20)				Optional	RTP Interface Protocol Description.
PLAN_DEF	RTP_IF_Version	S(10)				Optional	RTP Interface Protocol Version Number.
EXTENDED_PLAN_DEF	Encoding	S				Optional – Required if Fullname is present	Must be entered in "ENCODING=<value>" format The following encoding are defined: BASE64, UTF8, UNICODE At present only BASE64 encoding is supported.
EXTENDED_PLAN_DEF	Fullname	S				Optional	the patient full name formatted as per DICOM rules and as available in the DICOM file. Must be entered in "FULLNAME=<value>" format
RX_DEF SITE_SETUP_DEF SIM_DEF FIELD_DEF PDF_FIELD_DEF	Rx_Site_Name	S(20)				Optional	Prescription site name
RX_DEF	Technique	S(20)				Optional	Treatment technique
RX_DEF	Modality	S(10)				Optional	{Elect, Xrays, Co-60, Iridium, Orthovolt}
RX_DEF	Dose_Spec	S(10)				Optional	Where dose is specified
RX_DEF	Rx_Depth	nnn.n				Optional	Treatment depth in centimeters
RX_DEF	Dose_TTL	nnnnn	cGray	1	32767	Optional	Total dose prescribed for tx technique
RX_DEF	Dose_Tx	nnnn	(cGy/tx)	1	9999	Optional	Treatment dose per fraction
RX_DEF	Pattern	S(60)				Optional	Pattern of delivery (e.g., Daily, BID, etc.)
RX_DEF	Rx_Note	S(60)				Optional	Note for prescription (e.g., Treat w/full bladder)
RX_DEF	Number_of_Fields	nnn		1	999	Optional	Number of treatment fields for this technique.

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
SITE_SETUP_DEF	Patient_Orientation	S(10)				Optional	Enumerated values: HFS HFP HFDL HFDR FFS FFP FFDL FFDR
SITE_SETUP_DEF	Isocenter_Position_X	-nnn.nn	cm	-999.99	999.99	Optional	Isocenter Position X in centimeters
SITE_SETUP_DEF	Isocenter_Position_Y	-nnn.nn	cm	-999.99	999.99	Optional	Isocenter Position Y in centimeters
SITE_SETUP_DEF	Isocenter_Position_Z	-nnn.nn	cm	-999.99	999.99	Optional	Isocenter Position Z in centimeters
SITE_SETUP_DEF	Frame_Of_Reference_UID	S(64)				Optional	Frame Of Reference UID
SITE_SETUP_DEF	Structure_Set_UID	S(64)				Optional	Structure Set UID
SITE_SETUP_DEF	Table_Top_Vert_Displacement	-nnn.n	cm	-999.9	999.9	Optional	Table Top Vertical Setup Displacement in centimeters
SITE_SETUP_DEF	Table_Top_Long_Displacement	-nnn.n	cm	-999.9	999.9	Optional	Table Top Longitudinal Setup Displacement in centimeters
SITE_SETUP_DEF	Table_Top_Lat_Displacement	-nnn.n	cm	-999.9	999.9	Optional	Table Top Lateral Setup Displacement in centimeters
SIM_DEF FIELD_DEF PDF_FIELD_DEF	Field_Name	S(20)				Optional	Name of simulator or treatment field
SIM_DEF FIELD_DEF EXTENDED_FIELD_DEF PDF_FIELD_DEF MLC_DEF CONTROL_PT_DEF MLC_SHAPE_DEF DOSE_DEF	Field_ID	S(5)				Required	Unique field identifier (alphanumeric allowed)
SIM_DEF FIELD_DEF PDF_FIELD_DEF	Field_Note	S(60)				Optional	Setup note associated with this field
SITE_SETUP_DEF SIM_DEF FIELD_DEF PDF_FIELD_DEF	Treatment_Machine	S(20)				Required	Name of treatment machine
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Gantry_Angle	-nnn.n	degrees	-360.0	360.0	Required	Gantry angle for treatment
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Collimator_Angle	-nnn.n	degrees	-360.0	360.0	Required	Collimator angle for treatment

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Field_X_Mode	S(3)				Required	{Sym, Asy} Symmetric, Asymmetric
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Field_X	nn.n	cm	00.0	50.0	Required	If X Mode = Asy, X = X1 + X2 If X Mode = Sym, X1/X2 ignored
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Collimator_X1	-nn.n	cm	-25.0	25.0	Required	Collimator X1 position
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Collimator_X2	-nn.n	cm	-25.0	25.0	Required	Collimator X2 position
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Field_Y_Mode	S(3)				Required	{Sym, Asy} Symmetric, Asymmetric
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Field_Y	nn.n	cm	00.0	50.0	Required	If Y Mode = Asy, Y = Y1 + Y2 If Y Mode = Sym, Y1/Y2 ignored
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Collimator_Y1	-nn.n	cm	-25.0	25.0	Required	Collimator Y1 position
SIM_DEF FIELD_DEF CONTROL_PT_DEF	Collimator_Y2	-nn.n	cm	-25.0	25.0	Required	Collimator Y2 position
SITE_SETUP_DEF SIM_DEF FIELD_DEF CONTROL_PT_DEF	Couch_Vertical	-nnn.n	cm	-999.9	999.9	Optional	Vertical position of couch
SITE_SETUP_DEF SIM_DEF FIELD_DEF CONTROL_PT_DEF	Couch_Lateral	-nnn.n	cm	-999.9	999.9	Optional	Lateral position of couch
SITE_SETUP_DEF SIM_DEF FIELD_DEF CONTROL_PT_DEF	Couch_Longitudinal	-nnn.n	cm	-999.9	999.9	Optional	Longitudinal position of couch
SITE_SETUP_DEF SIM_DEF FIELD_DEF CONTROL_PT_DEF	Couch_Angle	-nnn.n	degrees	-20.0	380.0	Optional	Couch turntable rotation position
SITE_SETUP_DEF SIM_DEF FIELD_DEF CONTROL_PT_DEF	Couch_Pedestal	-nnn.n	degrees	-20.0	380.0	Optional	Couch top rotation position
SIM_DEF FIELD_DEF	SAD	nnn.n	cm	30.0	999.9	Optional	Source Axis Distance
SIM_DEF	AP_Separation	nn.n	cm			Optional	AP Separation
SIM_DEF	PA_Separation	nn.n	cm			Optional	PA Separation
SIM_DEF	Lateral_Separation	nn.n	cm			Optional	Lateral Separation

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
SIM_DEF	Tangential_Separation	nn.n	cm			Optional	Tangential Separation
SIM_DEF	Other_Label_1	S(10)				Optional	"Other" Label 1
SIM_DEF	SSD1	nnn.n	cm	10.0	999.9	Optional	Source Surface Distance
SIM_DEF	SFD1	nnn.n	cm			Optional	Source Film Distance
SIM_DEF	Other_Label_2	S(10)				Optional	"Other" Label 2
SIM_DEF	Other_Measurement_1	nnn.n	cm			Optional	Other Measurement 1
SIM_DEF	Other_Measurement_2	nnn.n	cm			Optional	Other Measurement 2
SIM_DEF	Other_Label_3	S(10)				Optional	"Other" Label 3
SIM_DEF	Other_Measurement_3	nnn.n	cm			Optional	Other Measurement 3
SIM_DEF	Other_Measurement_4	nnn.n	cm			Optional	Other Measurement 4
SIM_DEF	Other_Label_4	S(10)				Optional	"Other" Label 4
SIM_DEF	Blade_X_Mode	S(3)				Optional	{Sym, Asy} Symmetric, Asymmetric
SIM_DEF	Blade_X	nn.n	cm	00.0	50.0	Optional	Blade X Opening If X Mode = Asy, X = X1 + X2 If X Mode = Sym, X1/X2 ignored
SIM_DEF	Blade_X1	-nn.n	cm	-25.0	25.0	Optional	Blade X1
SIM_DEF	Blade X2	-nn.n	cm	-25.0	25.0	Optional	Blade X2
SIM_DEF	Blade_Y_Mode	S(3)				Optional	{Sym, Asy} Symmetric, Asymmetric
SIM_DEF	Blade_Y	nn.n	cm	00.0	50.0	Optional	Blade Y opening If Y Mode = Asy, Y = Y1 + Y2 If Y Mode = Sym, Y1/Y2 ignored
SIM_DEF	Blade_Y1	-nn.n	cm	-25.0	25.0	Optional	Blade Y1
SIM_DEF	Blade Y2	-nn.n	cm	-25.0	25.0	Optional	Blade Y2
SIM_DEF	II_Lateral	nn.n	cm			Optional	Image Intensifier lateral position
SIM_DEF	II_Longitudinal	nn.n	cm			Optional	Image Intensifier longitudinal position
SIM_DEF	II_Vertical	nn.n	cm			Optional	Image Intensifier vertical position
SIM_DEF	KVP	nnn	kVP			Optional	Kilovolts peak for xray tube
SIM_DEF	MA	nnn	MA			Optional	Milliamps of xray tube current
SIM_DEF	Seconds	nnnn.nn	seconds			Optional	Seconds for exposure
FIELD_DEF PDF_FIELD_DEF	Field_Dose	nnnn.nn	cGray	.01	9999.99	Optional	Dose planned for this field
FIELD_DEF	Field_Monitor_Units	nnnn.nn	MU	.01	9999.99	Required	MU planned for field

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
FIELD_DEF	Wedge_Monitor_Units	nnnn.nn	MU	0.00	9999.99	Optional	MU delivered w/wedge in-beam (for Philips machines w/autowedge)
FIELD_DEF PDF_FIELD_DEF	Treatment_Type	S(10)				Required	{Arc, Dynamic, Static, Setup, VMAT, DMLC, StepNShoot}
FIELD_DEF PDF_FIELD_DEF	Modality	S(5)				Required	{Co-60, E/HD, Elect, Xrays}
FIELD_DEF PDF_FIELD_DEF CONTROL_PT_DEF	Energy	nn	MeV	1	99	Optional	Energy of Treatment Beam
FIELD_DEF	Time	nn.nn	Minutes	1	99.99	Optional	Treatment Time in minutes
FIELD_DEF	Doserate	nnnn	MU/Min	10	9999	Optional	MU/min dose rate output
FIELD_DEF CONTROL_PT_DEF	SSD	nnn.n	cm	10.0	999.9	Optional	Source Surface Distance
SITE_SETUP_DEF FIELD_DEF	Tolerance_Table	n		0	99	Optional	1-99 (RTP & RTM must coordinate)
FIELD_DEF	Arc_Direction	S(3)				Required if Treatment Type is ARC or VMAT	{CW,CCW}
FIELD_DEF	Arc_Start_Angle	-nnn.n	degrees	-360.0	360.0	Required if Treatment Type is ARC or VMAT	Arc therapy start angle
FIELD_DEF	Arc_Stop_Angle	-nnn.n	degrees	-360.0	360.0	Required if Treatment Type is ARC or VMAT	Arc therapy stop angle
FIELD_DEF	Arc_MU_Degree	nn.nn	MU/Deg	0.00	99.99	Required if Treatment Type is ARC or VMAT	MU/Degree for arc therapy
FIELD_DEF	Wedge	S(10)				Optional Valid only if Modality = Xrays	Wedge type
FIELD_DEF	Dynamic_Wedge	S(10)				Optional Valid only if Modality = Xrays	Dynamic wedge type
FIELD_DEF	Block	S(10)				Optional Valid only if Modality = Xrays	Block code or name
FIELD_DEF	Compensator	S(10)				Optional Valid only if Modality = Xrays	Compensator code or name
FIELD_DEF	e_Applicator	S(10)				Optional Valid only if Modality = Elect	electron applicator type
FIELD_DEF	e_Field_Def_Aperture	S(10)				Optional Valid only if Modality = Elect	Final elec applicator aperture code or name
FIELD_DEF	Bolus	S(10)				Optional	Bolus size
FIELD_DEF	Portfilm_MU_Open	nn.nn	MU	0	20	Optional	Open port exposure MU

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
FIELD_DEF	Portfilm_Coeff_Open	n.nnnnn		0	1.00000	Optional	Open exposure dose coefficient
FIELD_DEF	Portfilm_Delta_Open	nn.nn	cm	0	50	Optional	Delta opening beyond tx field
FIELD_DEF	Portfilm_MU_Treat	nn.nn	MU	0	20	Optional	Treat port exposure MU
FIELD_DEF	Portfilm_Coeff_Treat	n.nnnnn		0	1.00000	Optional	Treat exposure dose coefficient
PDF_FIELD_DEF	Primary_Dosimeter_Unit	S(10)				Required	Meterset unit Enumerated values are: min sec MU
PDF_FIELD_DEF	Meterset	nnnnnn.nnn		0	999999.999	Required	Original Plan UID
PDF_FIELD_DEF EXTENDED_FIELD_DEF	Original_Plan_UID	S(64)				Required	Original Plan UID
PDF_FIELD_DEF EXTENDED_FIELD_DEF	Original_Beam_Number	nnnnn				Optional	Original Beam Number
PDF_FIELD_DEF EXTENDED_FIELD_DEF	Original_Beam_Name	S(64)				Optional	Original Beam Name
EXTENDED_FIELD_DEF	IsFFF	n				Optional	This is a bit value so valid values are 0 or 1. This setting is interface specific and stands for True Beam Flattening Filter Free.
EXTENDED_FIELD_DEF	Accessory_Code	S(10)				Optional	If value is provided and is not NULL, this must match an existing `Applicator` defined in the machine characterization record
EXTENDED_FIELD_DEF	Accessory_Type					Optional	If value is provided and not NULL, should be Applicator.
EXTENDED_FIELD_DEF	High_Dose_Authorization	S(16)				Optional	If value is provided and is not NULL, this must have an Allowable value and High Dose capability must be defined in the machine characterization record Allowable value “SRS” is interface specific. Other values ignored.
MLC_DEF	MLC_Type	n		1	5	Required	1 = GE, 2 = Philips, 3 = Scandatronics, 4 = Siemens, 5 = Varian
MLC_DEF	MLC_Leaves	nn		20	50	Required	Number of MLC leaves per side

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
MLC_DEF CONTROL_PT_DEF	MLC_LPn	-nn.nn	cm	-25.0	25.0	Required	MLC Leaf Position
CONTROL_PT_DEF	MLC_Type	nn		1	12	Required	1 = GE, 2 = Elekta /Philips, 3 = Scandatronics, 4 = Siemens, 5 = Varian, 6 = BrainLab, 7 = Radionics, 8 = Liebinger-Fisher, 9 = Wellhofer, 10 = Mitsubishi, 11 = Other, 12 = MRC
CONTROL_PT_DEF	MLC_Leaves	nnn		0,20	100	Required	Number of MLC leaves per side
CONTROL_PT_DEF	Total_Control_Points	nnn		1	999	Required	Total number of control points associated with the given field.
CONTROL_PT_DEF MLC_SHAPE_DEF	Control_Pt_Number	nnn		0	998	Required	Used to identify a control point. Must start at 0.
CONTROL_PT_DEF	MU_Convention	n				Required	1 – MU as fraction 2 – cMU as absolute
CONTROL_PT_DEF	Monitor_Units	n.nnnnnn nnnnnn	 cMU	0.000000 0	1.000000 999999	Required	Fraction of total MU or Absolute cMU
CONTROL_PT_DEF	Wedge_Position	S(3)				Optional Valid only if Wedge MU > 0 in the containing FIELD_DEF record	{In,Out}
CONTROL_PT_DEF	Doserate	nnnn	MU/min	0	9999	Optional	Doserate output
CONTROL_PT_DEF	Scale_Convention	n				Required	1=Native, 2=IEC
CONTROL_PT_DEF	Gantry_Dir	S(3)				Required if Treatment Type is VMAT	{CW,CCW,NULL}
CONTROL_PT_DEF	Collimator_Dir	S(3)				Optional	{CW,CCW,NULL}
CONTROL_PT_DEF	Couch_Dir	S(3)				Optional	{CW,CCW,NULL}
CONTROL_PT_DEF	Couch_Ped_Dir	S(3)				Optional	{CW,CCW,NULL}
MLC_SHAPE_DEF	Total_Shape_Points	nnn		1	160	Required	Total number of X,Y pairs that are used to define a MLC shape (polygon).
MLC_SHAPE_DEF	$X_Coordinate_n$	-nn.nn	cm	-25.00	+25.00	Required	X coordinate value of coordinate pair that specifies the location of a point in 2D space.. The center of this coordinate space is 0 and refers to the isocenter in a beams eye view.

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RTP Import/Export Keyword	Element Label	Data Format	Unit of Measure	Min Value	Max Value	Required, Optional, Dependencies	Notes
MLC_SHAPE_DEF	$Y_Coordinate_n$	-nn.nn	cm	-25.00	+25.00	Required	Y coordinate value of coordinate pair that specifies the location of a point in 2D space. The center of this coordinate space is 0 and refers to the isocenter in a beams eye view.
DOSE_DEF DOSE_ACTION	Region_Name	S(20)				Required	Name of region of interest
DOSE_DEF	Region_Prior_Dose	nnnnn	cGray	1	32767	Required	Starting dose for this region
DOSE_DEF	Reg_Coeff	n.nnnnn		0	9.99999	Required	Coefficient of prescribed field dose that will be delivered to this site. (Primary sites will typically have a coefficient of 1.00000)
DOSE_DEF	Actual_Dose	nnnnn	cGray	0	32767	Optional	Actual dose delivered (for export only)
DOSE_DEF	Actual_Fractions	nnn		0	999	Optional	Actual fractions delivered (for export only)
DOSE_ACTION	Action_Dose	nnnnn	cGray	1	32767	Required	Dose action point for this region
DOSE_ACTION	Action_Note	S(60)				Required	Note on action to be taken (e.g., cone down)
ALL	CRC	nnnnn		0	65536	Required	16 bit Cyclic Redundancy Check See Appendix A

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Appendix A: cyclical redundancy check (CRC) Rules

The last field of each record shall contain a calculated CRC for that record. The CRC shall be a 16 bit unsigned CRC, calculated according to the CCITT algorithm with a seed value of `0521 hex`. Rules for calculating the CRC value follow:

- All characters in the record shall be used in the calculation, including KEYWORDS, data items, quotes and field delimiting commas.
- The first character to be used for the CRC calculation shall be the start quote for the KEYWORD.
- The last character to be used for the CRC calculation shall be the comma delimiting the last field prior to the CRC field in the record.
- Once the CRC is calculated for a record, the value shall be placed in quotes in the last field for that record, according to the specifications in the File Format section of this document.

The following is sample code to calculate record CRC values. This code can be used directly by any ANSI Standard C compiler. To use this code, build up a buffer containing the record up to and including the last comma before the CRC value, and pass this function the address and length of the buffer.

```
unsigned int rtpcrc(char *buf, unsigned int len)
  {
  unsigned int seed = 0x0521;
  static unsigned int crc_tbl[] = {
     0x0000, 0xC0C1, 0xC181, 0x0140, 0xC301, 0x03C0, 0x0280, 0xC241,
     0xC601, 0x06C0, 0x0780, 0xC741, 0x0500, 0xC5C1, 0xC481, 0x0440,
     0xCC01, 0x0CC0, 0x0D80, 0xCD41, 0x0F00, 0xCFC1, 0xCE81, 0x0E40,
     0x0A00, 0xCAC1, 0xCB81, 0x0B40, 0xC901, 0x09C0, 0x0880, 0xC841,
     0xD801, 0x18C0, 0x1980, 0xD941, 0x1B00, 0xDBC1, 0xDA81, 0x1A40,
     0x1E00, 0xDEC1, 0xDF81, 0x1F40, 0xDD01, 0x1DC0, 0x1C80, 0xDC41,
     0x1400, 0xD4C1, 0xD581, 0x1540, 0xD701, 0x17C0, 0x1680, 0xD641,
     0xD201, 0x12C0, 0x1380, 0xD341, 0x1100, 0xD1C1, 0xD081, 0x1040,
     0xF001, 0x30C0, 0x3180, 0xF141, 0x3300, 0xF3C1, 0xF281, 0x3240,
     0x3600, 0xF6C1, 0xF781, 0x3740, 0xF501, 0x35C0, 0x3480, 0xF441,
     0x3C00, 0xFCC1, 0xFD81, 0x3D40, 0xFF01, 0x3FC0, 0x3E80, 0xFE41,
     0xFA01, 0x3AC0, 0x3B80, 0xFB41, 0x3900, 0xF9C1, 0xF881, 0x3840,
     0x2800, 0xE8C1, 0xE981, 0x2940, 0xEB01, 0x2BC0, 0x2A80, 0xEA41,
     0xEE01, 0x2EC0, 0x2F80, 0xEF41, 0x2D00, 0xEDC1, 0xEC81, 0x2C40,
     0xE401, 0x24C0, 0x2580, 0xE541, 0x2700, 0xE7C1, 0xE681, 0x2640,
     0x2200, 0xE2C1, 0xE381, 0x2340, 0xE101, 0x21C0, 0x2080, 0xE041,
     0xA001, 0x60C0, 0x6180, 0xA141, 0x6300, 0xA3C1, 0xA281, 0x6240,
     0x6600, 0xA6C1, 0xA781, 0x6740, 0xA501, 0x65C0, 0x6480, 0xA441,
     0x6C00, 0xACC1, 0xAD81, 0x6D40, 0xAF01, 0x6FC0, 0x6E80, 0xAE41,
     0xAA01, 0x6AC0, 0x6B80, 0xAB41, 0x6900, 0xA9C1, 0xA881, 0x6840,
     0x7800, 0xB8C1, 0xB981, 0x7940, 0xBB01, 0x7BC0, 0x7A80, 0xBA41,
     0xBE01, 0x7EC0, 0x7F80, 0xBF41, 0x7D00, 0xBDC1, 0xBC81, 0x7C40,
     0xB401, 0x74C0, 0x7580, 0xB541, 0x7700, 0xB7C1, 0xB681, 0x7640,
     0x7200, 0xB2C1, 0xB381, 0x7340, 0xB101, 0x71C0, 0x7080, 0xB041,
     0x5000, 0x90C1, 0x9181, 0x5140, 0x9301, 0x53C0, 0x5280, 0x9241,
     0x9601, 0x56C0, 0x5780, 0x9741, 0x5500, 0x95C1, 0x9481, 0x5440,
     0x9C01, 0x5CC0, 0x5D80, 0x9D41, 0x5F00, 0x9FC1, 0x9E81, 0x5E40,
     0x5A00, 0x9AC1, 0x9B81, 0x5B40, 0x9901, 0x59C0, 0x5880, 0x9841,
     0x8801, 0x48C0, 0x4980, 0x8941, 0x4B00, 0x8BC1, 0x8A81, 0x4A40,
     0x4E00, 0x8EC1, 0x8F81, 0x4F40, 0x8D01, 0x4DC0, 0x4C80, 0x8C41,
     0x4400, 0x84C1, 0x8581, 0x4540, 0x8701, 0x47C0, 0x4680, 0x8641,
     0x8201, 0x42C0, 0x4380, 0x8341, 0x4100, 0x81C1, 0x8081, 0x4040,
     };
  while(len--)
     seed = crc_tbl[*((unsigned char *) buf)++ ^ (unsigned char) seed] ^
            (unsigned char) (seed >> 8);
```


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```
    return(seed);
}
```


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Appendix B: SAMPLE IMPORT Validation Rules

The following file/record validation rules are a subset of those utilized by IMPAC's import program, available in version 4.00 of IMPAC's Multi-ACCESS management system. Please see IMPAC's RTP Import/Export protocol conformance statement for version-specific implementation details. The rules below are offered as a guideline for vendors who wish to develop their own RTP Import/Export protocol conformance statement. IMPAC's conformance statement, in combination with the RTP vendor's, should help reduce the number of iterations needed for a successful import into IMPAC's Multi-ACCESS/MOSAIQ management system. *These rules are not part of the formal specification and may change at any time*. They also need not be applied to other uses of the RTP Import/Export process.

- The calculated CRC at the end of each record must match the value in the CRC field of the record, or else the import shall be aborted.
- The first record must be the `PLAN_DEF` record.
- Continue with import if and only if the following condition exists:
  Patient Primary ID matches an existing patient.
- If an import candidate `PLAN_DEF:Course_ID` conflicts with an existing course, the imported course shall be discarded and a warning message shall be generated. Otherwise, a new course shall be created.
- If an import candidate `RX_DEF:Rx_Site_Name` conflicts with an existing prescription, the imported prescription shall be discarded and a warning message shall be generated. Otherwise, a new prescription shall be created.
- If an import candidate `SIM_DEF:Field_ID` conflicts with an existing simulation field ID, the imported simulation field shall be discarded and a warning message shall be generated. Otherwise, a new simulation field shall be created.
- If an import candidate `FIELD_DEF:Field_ID` conflicts with an existing treatment field ID, the existing treatment field's revision shall be incremented and the imported field shall be imported as the current revision. A warning message shall be generated for any conflicts. Otherwise, a new treatment field shall be created.
- If an import candidate `PDF_FIELD_DEF:Field_ID` conflicts with an existing treatment field ID, the existing treatment field's revision shall be incremented and the imported field shall be imported as the current revision. A warning message shall be generated for any conflicts. Otherwise, a new treatment field shall be created.
- The prescription site name (*Rx_Site_Name*) for an imported simulation field and treatment field shall be set if and only if a match is detected with an already defined prescription site. If a match is not found for the specified *Rx Site*, a warning message shall be generated and the item shall be left blank.
- The *Treatment Machine* for an imported simulation field and treatment field shall be set if and only if a match is detected with an already defined *Treatment Machine*. If a match is not found for the specified *Treatment Machine,* a warning message shall be generated and the item shall be left blank.
- If an import candidate `MLC_DEF:Field_ID` does not match an existing treatment field, the MLC record shall be discarded and a warning message shall be generated. Otherwise, the MLC definition shall be added to the field.
- If an import candidate `DOSE_DEF:Region_Name` conflicts with an existing dose tracking site, the imported record shall be discarded and a warning message shall be generated. Otherwise, a new dose tracking site shall be created.
- If an import candidate `DOSE_DEF:Field_ID` conflicts with an existing dose coefficient, the existing coefficient shall be overwritten and a warning message shall be generated. Otherwise, a new dose tracking coefficient shall be created.

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- If an import candidate `DOSE_ACTION:Region_Name` exists, the imported record shall be discarded and a warning message shall be generated. Otherwise, the dose action point shall be added.
- `CONTROL_PT_DEF` and `MLC_SHAPE_DEF` records are not implemented in version 4.00 of the IMPAC Multi-ACCESS management system.

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