

## DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2016/09/19
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Submission Date	2016/01/20

Correction Number	CP-1585																					
Log Summary: Add Category And Type Codes to Fiducials, Surface Scan Mesh and Point Cloud IODs																						
Name of Standard PS3.3, PS3.6, PS3.16 2016c																						
Rationale for Correction: A Category Code and Type Code sequence pair is present in the IODs as shown in the following table:																						
<table border="1"> <thead> <tr> <th>SOP Class</th> <th>SOP Class UID</th> <th>Present</th> </tr> </thead> <tbody> <tr> <td>Segmentation IOD</td> <td>1.2.840.10008.5.1.4.1.1.6 6.4</td> <td>Yes Segment Description Macro: (0062,0003), (0062,0003)</td> </tr> <tr> <td>Surface Segmentation IOD</td> <td>1.2.840.10008.5.1.4.1.1.6 6.5</td> <td>Yes Segment Description Macro: (0062,0003), (0062,0003)</td> </tr> <tr> <td>Spatial Fiducials IOD</td> <td>1.2.840.10008.5.1.4.1.1.6 6.2</td> <td>Partially</td> </tr> <tr> <td>RT Structure Set IOD</td> <td>1.2.840.10008.5.1.4.1.1.4 81.3</td> <td>Yes (0062,0003), (3006,0086)</td> </tr> <tr> <td>Surface Scan Mesh IOD</td> <td>1.2.840.10008.5.1.4.1.1.6 8.1</td> <td>No</td> </tr> <tr> <td>Surface Scan Point Cloud IOD</td> <td>1.2.840.10008.5.1.4.1.1.6 8.2</td> <td>No</td> </tr> </tbody> </table>		SOP Class	SOP Class UID	Present	Segmentation IOD	1.2.840.10008.5.1.4.1.1.6 6.4	Yes Segment Description Macro: (0062,0003), (0062,0003)	Surface Segmentation IOD	1.2.840.10008.5.1.4.1.1.6 6.5	Yes Segment Description Macro: (0062,0003), (0062,0003)	Spatial Fiducials IOD	1.2.840.10008.5.1.4.1.1.6 6.2	Partially	RT Structure Set IOD	1.2.840.10008.5.1.4.1.1.4 81.3	Yes (0062,0003), (3006,0086)	Surface Scan Mesh IOD	1.2.840.10008.5.1.4.1.1.6 8.1	No	Surface Scan Point Cloud IOD	1.2.840.10008.5.1.4.1.1.6 8.2	No
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<p>In the context of Supplement 147 (RT Prescription and Segment Annotation) it was proposed to add the capability of a Category / Type code pair to the IODs where this code pair is not present. The code pair would be added in the RT Segment Annotation IOD.</p> <p>However, since the facility of a coding geometric entities is useful in a general context, it was determined that those IODs which also represent geometric items, but lack the coding, should get the coding facility as well.</p> <p>This Change Proposal adds the coding facilities to the IODs where the coding is not present along the table above.</p> <p>Table C.7.6.22-2. Specimen Macro Attributes</p>																						
Correction Wording:																						

In Part 3, add the following in section C.21.2 Spatial Fiducials Module

## C.21.2 Spatial Fiducials Module

Table C.21.2-1 defines the general Attributes of the Registration.

**Table C.21.2-1. Spatial Fiducials Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Content Date	(0008,0023)	1	The date the content creation started.
Content Time	(0008,0033)	1	The time the content creation started.
<i>Include Table 10-12 "Content Identification Macro Attributes"</i>			
Fiducial Set Sequence	(0070,031C)	1	A sequence of items, each of which is a fiducial set.  One or more Items shall be included in this Sequence.
>Frame of Reference UID	(0020,0052)	1C	Identifies a Frame of Reference that may or may not be an image set (e.g., an atlas or physical space). See Section C.7.4.1.1.1 for further explanation. Required if Referenced Image Sequence (0008,1140) is absent. May be present otherwise.
>Referenced Image Sequence	(0008,1140)	1C	Identifies the set of images in which the fiducials are located.  One or more Items shall be included in this Sequence.  Required if Frame of Reference UID (0020,0052) is absent. May be present otherwise.  All referenced images shall have the same Frame of Reference UID if present in the images.
<i>&gt;&gt;Include Table 10-3 "Image SOP Instance Reference Macro Attributes"</i>			
>Fiducial Sequence	(0070,031E)	1	A sequence that specifies fiducials, one item per fiducial.  One or more Items shall be included in this Sequence.
>>Fiducial Identifier	(0070,0310)	1	A fiducial assignment identifier that is unique within this Fiducial Sequence item but may match the fiducial identifier of an equivalent feature in another item.
<b>&gt;&gt;Fiducials Property Category Code Sequence</b>	<b>(0070,031F)</b>	<b>3</b>	<b><u>Sequence defining the general category of the property the fiducial represents.</u></b>  <b><u>Only a single Item is permitted in this Sequence.</u></b>

Attribute Name	Tag	Type	Attribute Description
<b>&gt;&gt;&gt;Include Table 8.8-1 "Code Sequence Macro Attributes"</b>			<b><u>Baseline CID 7110 "Fiducials Categories"</u></b>
>>Fiducial Identifier Code Sequence	(0070,0311)	1C	A code sequence for a term that identifies a well-known fiducial type (potentially including methodology, anatomy, tools, etc.).  Only a single Item shall be included in this Sequence.  Required if Identifier (0070,0310) is absent. May be present otherwise.
<b>&gt;&gt;&gt;Include Table 8.8-1 "Code Sequence Macro Attributes"</b>			<b><u>Defined CID 7101 "Brain Atlas Fiducials".</u></b> <b><u>Baseline CID 7111 "Fiducials".</u></b>
>>Fiducial UID	(0070,031A)	3	Globally unique identifier for the fiducial instance of this fiducial assignment.
>>Fiducial Description	(0070,030F)	3	User description or comments about the fiducial.
>>Shape Type	(0070,0306)	1	See Section C.21.2.1.1 for Defined Terms.
>>Number of Contour Points	(3006,0046)	1C	Number of points (triplets) in Contour Data (3006,0050).  Required if Contour Data is present.
>>Contour Data	(3006,0050)	1C	Specifies the coordinates of this item's fiducial. One triplet (x,y,z) shall be present for each point in the fiducial. See Section C.21.2.1.2 for further explanation. Required if Frame of Reference UID (0020,0052) is present in this item of the Fiducial Set Sequence (0070,031C). Shall not be present otherwise.  Note  Contour Data may not be properly encoded if Explicit VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.
>>Contour Uncertainty Radius	(0070,0312)	3	The estimated uncertainty radius for the Contour Data in mm. See Section C.21.2.1.3
>>Graphic Coordinates Data Sequence	(0070,0318)	1C	The image pixel locations of the fiducial's points.  One or more Items shall be included in this Sequence.  More than one item shall be present only if a fiducial spans more than one image.  Required if Contour Data is not present. May be present otherwise.
>>>Graphic Data	(0070,0022)	1	Graphic point coordinates of the fiducial points in the image of the Referenced Image Sequence. If Fiducial's Contour Data (3006,0050) is present, these points correlate to the points in the Contour Data, one row-column pair for each point and in

Attribute Name	Tag	Type	Attribute Description
			the same order. See Section C.10.5.1.2 for further explanation.
>>>Referenced Image Sequence	(0008,1140)	1	A sequence that specifies the image containing the fiducial's graphic coordinates.  Only a single Item shall be included in this Sequence.  Shall be an image within the set of the images in the Referenced Image Sequence (0008,1140) of the encapsulating Fiducial Set Sequence (0070,031C) item.
>>>Include Table 10-3 "Image SOP Instance Reference Macro Attributes"			

In Part 3, add the following in section C.27.1 Surface Mesh Module

### C.27.1 Surface Mesh Module

Table C.27-1 specifies the Attributes of the Surface Mesh Module.

**Table C.27-1. Surface Mesh Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Number of Surfaces	(0066,0001)	1	Number of surfaces contained in the Instance. Shall be 1 or more. Shall be the same as the number of Items in Surface Sequence (0066,0002).
Surface Sequence	(0066,0002)	1	The surfaces that are described within the data.  One or more Items shall be included in this Sequence.  There shall be Number of Surfaces (0066,0001) Items in the sequence.  See Section C.27.1.1.1.
>Surface Number	(0066,0003)	1	Identification number of the surface. Uniquely identifies a surface within this SOP instance. Shall start at a value of 1, and increase monotonically by 1.
>Surface Comments	(0066,0004)	3	User-defined comments describing the surface.
<b>&gt;Segmented Property Category Code Sequence</b>	<b>(0062,0003)</b>	<b>3</b>	<b>Sequence defining the general category of the property the surface represents.</b>  <b>Only a single Item is permitted in this Sequence.</b>
<b>&gt;&gt;Include Table 8.8-1 "Code Sequence Macro Attributes"</b>			<b>Baseline CID 7150 "Segmentation Property Categories".</b>
<b>&gt;Segmented Property Type Code Sequence</b>	<b>(0062,000F)</b>	<b>3</b>	<b>Sequence defining the specific property the surface</b>

Attribute Name	Tag	Type	Attribute Description
			<p><u>represents.</u></p> <p><b>Note:</b> "Property" is used in the sense of <u>meaning "what the surface represents", whether it be a physical or biological object, be real or conceptual, having spatial, temporal or functional extent or not. I.e., it is what the segment "is" (as opposed to some feature, attribute, quality, or characteristic of it, like color or shape or size).</u></p> <p><u>Only a single Item is permitted in this Sequence.</u></p>
<b>&gt;&gt;Include Table 8.8-1 "Code Sequence Macro Attributes"</b>			<b><u>Baseline CID 7151 "Segmentation Property Types".</u></b>
>Surface Processing	(0066,0009)	2	<p>Specifies whether the surface has been modified subsequent to the original generation of the surface.</p> <p>Enumerated Values:</p> <p><b>YES</b> <b>NO</b></p> <p>See Section C.27.1.1.2.</p>
>Surface Processing Ratio	(0066,000A)	2C	<p>The Ratio of Remaining points to Original points after processing. Required if Surface Processing (0066,0009) is YES.</p>
>Surface Processing Description	(0066,000B)	3	<p>A textual description of the surface processing performed.</p>
>Surface Processing Algorithm Identification Sequence	(0066,0035)	2C	<p>Describes the processing method.</p> <p>Zero or one Item shall be included in this Sequence.</p> <p>Required if Surface Processing (0066,0009) is YES.</p>
<b>&gt;&gt;Include Table 10-19 "Algorithm Identification Macro Attributes"</b>			<b><i>For Algorithm Family Code Sequence (0066,002F) Baseline CID 7162 "Surface Processing Algorithm Families".</i></b>
>Recommended Display Grayscale Value	(0062,000C)	1	<p>A default single gray unsigned value in which it is recommended that the maximum pixel value in this surface be rendered on a monochrome display. The units are specified in P-Values from a minimum of 0000H (black) up to a maximum of FFFFH (white).</p> <p>Note</p> <p>The maximum P-Value for this Attribute may be different from the maximum P-Value from the output of the Presentation LUT, which may be less than 16 bits in depth.</p>
>Recommended Display CIELab Value	(0062,000D)	1	<p>A default triplet value in which it is recommended that the surface be rendered on a color display. The units are specified in PCS-Values, and the value is encoded as CIELab.</p> <p>See Section C.10.7.1.1</p>

Attribute Name	Tag	Type	Attribute Description
>Recommended Presentation Opacity	(0066,000C)	1	Specifies the opacity in which it is recommended that the surface be rendered.  See Section C.27.1.1.3.
>Recommended Presentation Type	(0066,000D)	1	Specifies the presentation type in which it is recommended that the surface be rendered.  See Section C.27.1.1.3.
>Recommended Point Radius	(0066,0037)	3	Specifies the radius of the vertex points defined in the Long Vertex Point Index List (0066,0043) with which it is recommended that the point be rendered.  The units shall be the same as the units of the coordinate system in which the point coordinates are specified.
>Recommended Line Thickness	(0066,0038)	3	Specifies the thickness of each edge or line defined in the Long Edge Point Index List (0066,0042) or Line Sequence (0066,0028) with which it is recommended that the line be rendered.  The units shall be the same as the units of the coordinate system in which the point coordinates are specified.
>Finite Volume	(0066,000E)	1	Indicates, whether the surface represents a solid ("waterproof") object with an outside and an inside.  Enumerated Values: <b>YES</b> Contains a finite volume <b>NO</b> Does not contain a finite volume <b>UNKNOWN</b> Might or might not contain a finite volume  See Section C.27.1.1.4.
>Manifold	(0066,0010)	1	Indicates whether the surface is describing an n-1 dimensional manifold in the underlying n-dimensional vector space.  Enumerated Values: <b>YES</b> Manifold in every point <b>NO</b> Does contain non-manifold points <b>UNKNOWN</b> Might or might not contain non-manifold points  See Section C.27.1.1.5.
>Surface Points Sequence	(0066,0011)	1	The point positions representing vertices of the surface.  Only a single Item shall be included in this Sequence.
>>Include Table C.27-2 "Points Macro Attributes"			
>Surface Points Normals Sequence	(0066,0012)	2	The normals on the surface for each point.  Zero or one Item shall be included in this Sequence.  See Section C.27.1.1.6.
>>Include Table C.27-3 "Vectors Macro Attributes"			<i>Number of Vectors (0066,001E) shall equal Number of Surface Points (0066,0015) in this Surface Sequence</i>

Attribute Name	Tag	Type	Attribute Description
			<p><i>Item.</i></p> <p><i>Vector Dimensionality (0066,001F) shall be 3.</i></p> <p><i>If Finite Volume (0066,000E) is YES, the normals of the vertices shall point toward the outside of the object. If Finite Volume (0066,000E) is not YES, the direction of the normals shall be consistent where possible.</i></p>
>Surface Mesh Primitives Sequence	(0066,0013)	1	Only a single Item shall be included in this Sequence.
>>Include Table C.27-4 "Surface Mesh Primitives Macro Attributes"			<i>The primitives' indices shall not exceed Number of Surface Points (0066,0015) in this Surface Sequence Item.</i>

In Part 3, add the following in section C.27.5 Point Cloud Module

### C.27.5 Point Cloud Module

Table C.27.5-1 specifies the Attributes of the Point Cloud Module.

**Table C.27.5-1. Point Cloud Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Surface Points Sequence	(0066,0011)	1	The point positions representing vertices of the surface. Only one Item shall be included in the sequence.
>Include Table C.27-2 "Points Macro Attributes"			
>Segmented Property Category Code Sequence	(0062,0003)	3	<b>Sequence defining the general category of the property the surface point set represents.</b> <b>Only a single Item is permitted in this Sequence.</b>
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			<b><u>Baseline CID 7150 "Segmentation Property Categories".</u></b>
>Segmented Property Type Code Sequence	(0062,000F)	3	<b>Sequence defining the specific property the surface point set represents.</b>  <b>Note: "Property" is used in the sense of meaning "what the surface represents", whether it be a physical or biological object, be real or conceptual, having spatial, temporal or functional extent or not. I.e., it is what the surface "is" (as opposed to some feature, attribute, quality, or characteristic of it, like color or shape or size).</b>  <b>Only a single Item is permitted in this Sequence.</b>
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			<b><u>No Baseline CID is defined.</u></b>
Surface Point Presentation Value	(0080,0006)	3	Contains a vector of P-Values to assign a gray value to

Attribute Name	Tag	Type	Attribute Description
Data			<p>each point.</p> <p>The number of values shall be equal to the value of Number Of Surface Points (0066,0015) in the Points Macro.</p> <p>Each value shall correspond to the respective point in the Point Coordinates Data (0066,0016).</p>
Surface Point Color CIE Lab Value Data	(0080,0007)	3	<p>Contains a vector of color triplets to assign colors to each point.</p> <p>The number of triplets shall be equal to the value of Number Of Surface Points (0066,0015) in the Points Macro.</p> <p>The units are PCS-Values, and the value is encoded as CIE Lab. See Section C.10.7.1.1.</p> <p>Each triplet shall correspond to the respective point in the Point Coordinates Data (0066,0016).</p>

*In Part 3, add a note to clarify what a "property" "is" in this usage:*

#### C.8.20.4.1 Segment Description Macro

Table C.8.20-4 specifies the attributes of the Segment Description Macro.

**Table C.8.20-4. Segment Description Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
Segment Number	(0062,0004)	1	Identification number of the segment. The value of Segment Number (0062,0004) shall be unique within the Segmentation instance in which it is created. See Section C.8.20.2.4.
Segment Label	(0062,0005)	1	User-defined label identifying this segment. This may be the same as Code Meaning (0008,0104) of Segmented Property Type Code Sequence (0062,000F).
Segment Description	(0062,0006)	3	User-defined description for this segment.
Segment Algorithm Type	(0062,0008)	1	<p>Type of algorithm used to generate the segment.</p> <p>Enumerated Values:</p> <p><b>AUTOMATIC</b>      calculated segment</p> <p><b>SEMIAUTOMATIC</b>      calculated segment with user assistance</p> <p><b>MANUAL</b>      user-entered segment</p>
<i>Include Table 10-7 "General Anatomy Optional Macro"</i>			May not be necessary if the anatomy is implicit in the



Attribute Name	Tag	Type	Attribute Description
<i>Attributes</i>			Segmented Property Type Code Sequence.
Segmented Property Category Code Sequence	(0062,0003)	1	Sequence defining the general category <b>of the property of this the segment represents</b> .  Only a single Item shall be included in this Sequence.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			<i>Baseline CID 7150 "Segmentation Property Categories".</i>
Segmented Property Type Code Sequence	(0062,000F)	1	Sequence defining the specific property <del>type of the</del> segment <b>represents</b> .  <b>Note: "Property" is used in the sense of meaning "what the segmented voxels represent", whether it be a physical or biological object, be real or conceptual, having spatial, temporal or functional extent or not. I.e., it is what the segment "is" (as opposed to some feature, attribute, quality, or characteristic of it, like color or shape or size).</b>  Only a single Item shall be included in this Sequence.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			<i>Baseline CID 7151 "Segmentation Property Types".</i>
>Segmented Property Type Modifier Code Sequence	(0062,0011)	3	Sequence defining the modifier of the property type of this segment.  One or more Items are permitted in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			<i>Baseline CID 244 "Laterality".</i>
Tracking ID	(0062,0020)	1C	A text label used for tracking a finding or feature, potentially across multiple reporting objects, over time. This label shall be unique within the domain in which it is used.  Required if Tracking UID (0062,0021) is present.  Note  1. May be used for tracking a finding or feature that is described by this segment, potentially across multiple objects, over time.  2. May or may not have the same value as Segment Label (0062,0005).  3. Related SR instances may exist, for example, to record measurements related to this segment, but need not exist for this

Attribute Name	Tag	Type	Attribute Description
			Attribute to be used. 4. This Attribute will have the same value as the value of the (112039, DCM, "Tracking Identifier") content item in SR instances that reference this Segment in this Segmentation Instance.
Tracking UID	(0062,0021)	1C	A unique identifier used for tracking a finding or feature, potentially across multiple reporting objects, over time. Required if Tracking ID (0062,0020) is present.  Note 1. May be used for tracking a finding or feature that is described by this segment, potentially across multiple objects, over time. 2. Related SR instances may exist, for example, to record measurements related to this segment, but need not exist for this Attribute to be used. 3. This Attribute will have the same value as the value of the (112040, DCM, "Tracking Unique Identifier") content item in SR instances that reference this Segment in this Segmentation Instance.

*In Part 3.16, add the following CIDs*

**CID 7110      Fiducials Categories**

**Context ID 7110  
Fiducials Categories**

**Type: Extensible      Version: 20160919**

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-CT ConceptID	UMLS Concept UniqueID
DCM	112171	Fiducial mark		
SRT	R-FF2E7	Anatomical point	711101009	C0504079
SRT	T-D002F	Body surface point	183973000	C0567332
SRT	R-FDCFF	Body reference point marker	706484002	C3872476

Context ID 7111  
Fiducials

Type: Extensible      Version: 20160919

Coding Scheme Designator	Code Value	Code Meaning
<i>Include CID 3496 "IVUS Fiducial Points"</i>		
<i>Include CID 3837 "Fiducial Feature"</i>		
<i>Include CID 7101 "Brain Atlas Fiducials"</i>		

*In PS 3.6, Section 6, add the following new attributes:*

<u>(0070,031F)</u>	<u>Fiducials Property Category Code Sequence</u>	<u>FiducialsPropertyCategoryCodeSequence</u>	<u>SQ</u>	<u>1</u>
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