

DICOM Correction Proposal

STATUS	Letter Ballot
Date of Last Update	2020/09/08
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Correction Number	CP-2037
Log Summary:	Inner and Outer Contours
Name of Standard	PS3.3
Rationale for Correction:	<p>The current implementation base of RT Structure Set SOP Instances in the domain of RT mainly produces contours that, if an inner void is to be expressed, does not utilize the “keyholing technique” as described by the DICOM Standard, but performs an combination of an exclusive disjunction.</p> <p>For safety reasons, it should be possible to express this different technique, while assuring that systems that do not support this can still operate safely and not consume contours using this different technique.</p> <p>Therefore, a deliberate breaking change is proposed to enable safe operation by introducing a new Enumerated Term on the Contour level of the ROI Contour Sequence. Consuming applications that are unaware of this term will be prevented from misinterpreting new data that does not utilize the keyholing technique.</p>
Correction Wording:	

Update in PS 3.3

C.8.8.6 ROI Contour Module

In general, a ROI can be defined by either a sequence of overlays or a sequence of contours. This Module, if present, is used to define the ROI as a set of contours. Each ROI contains a sequence of one or more contours, where a contour is either a single point (for a point ROI) or more than one point (representing an open or closed polygon).

Table C.8-42. ROI Contour Module Attributes

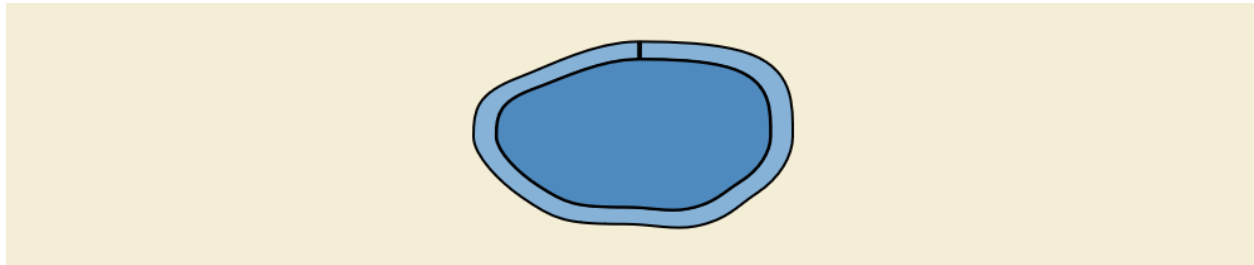
Attribute Name	Tag	Type	Attribute Description
ROI Contour Sequence	(3006,0039)	1	Sequence of Contour Sequences defining ROIs. One or more Items shall be included in this Sequence.
>Referenced ROI Number	(3006,0084)	1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).
>ROI Display Color	(3006,002A)	3	RGB triplet color representation for ROI, specified using the range 0-255.

Attribute Name	Tag	Type	Attribute Description
>Recommended Display Grayscale Value	(0062,000C)	3	<p>A default single gray unsigned value in which it is recommended that the contour 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 CIE Lab Value	(0062,000D)	3	<p>A default triplet value in which it is recommended that the contour be rendered on a color display. The units are specified in PCS-Values, and the value is encoded as CIE Lab. See Section C.10.7.1.1.</p>
>Contour Sequence	(3006,0040)	3	<p>Sequence of Contours defining ROI. One or more Items are permitted in this Sequence.</p>
>>Contour Number	(3006,0048)	3	<p>Identification number of the contour. The value of Contour Number (3006,0048) shall be unique within the Contour Sequence (3006,0040) in which it is defined. No semantics or ordering shall be inferred from this Attribute.</p>
...			
>>Contour Geometric Type	(3006,0042)	1	<p>Geometric type of contour. See Section C.8.8.6.1.</p> <p>Enumerated Values:</p> <p>POINT</p> <p style="padding-left: 40px;">single point</p> <p>OPEN_PLANAR</p> <p style="padding-left: 40px;">open contour containing coplanar points</p> <p>OPEN_NONPLANAR</p> <p style="padding-left: 40px;">open contour containing non-coplanar points</p> <p>CLOSED_PLANAR</p> <p style="padding-left: 40px;">closed contour (polygon) containing coplanar points</p> <p><u>CLOSEDPLANAR_XOR</u></p> <p style="padding-left: 40px;"><u>closed contour (polygon) containing coplanar points of an inner or outer contour combined using an XOR operator, see C.8.8.6.3.</u></p>
...			

C.8.8.6.3 Representing Inner and Outer Contours on an Image
Inner and Outer Contours can be represented by two different techniques:

An ROI with an excluded inner part can be represented with a single Contour on a plane using a “keyhole” technique. When a single ROI describes an excluded inner volume, this can be encoded with a single contour using a “keyhole” technique. In this method, an arbitrarily narrow channel is used to connect the outer contour to the inner contour, so that it is drawn as a single contour. An example of such a structure is shown in Figure C.8.8.6-1.

Points in space lying along the path defined by the contour are considered to be inside the ROI.



Replace Figure C.8.8.6-1 with the new figure below.

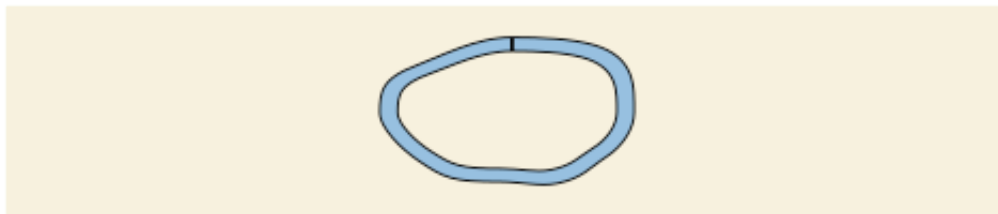


Figure C.8.8.6-1. Example of ROI with excluded inner volume

When more than one Contour is used to describe an ROI with an interior void not connected by an arbitrarily narrow channel, these Contours are combined by a geometric exclusive disjunction (“XOR”), thus extracting the inner from the outer Contour, see Figure C.8.8.6-n. The contours shall have the Contour Geometric Type (3006,0042) CLOSEDPLANAR XOR. If any of the Contours within an ROI is of Contour Geometric Type (3006,0042) CLOSEDPLANAR XOR, all Contours of that ROI shall be of the same type.

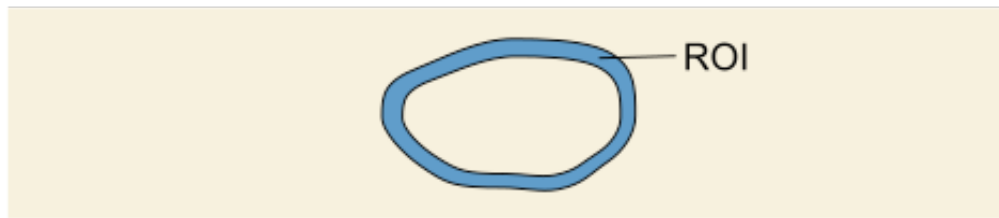


Figure C.8.8.6-n1
Example of ROI with contours exclusively added

Using this technique, it is also possible to create an ROI that includes disjoint parts of the ROI within an interior void, see Figure C.8.8.6-n2.

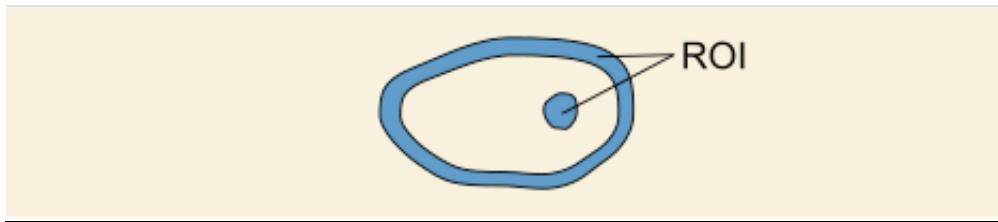


Figure C.8.8.6-n2
Example of ROI with disjoint parts