

## DICOM Correction Item

Correction Number	CP-564
Log Summary: Spatial locations preserved during processing flag	
Type of Modification	Name of Standard
Correction	PS 3.3, PS 3.6, PS 3.17 2004
Rationale for Correction	
<p>A mammography CAD system often prefers to analyze FOR PROCESSING images, yet these may be completely unsatisfactory for viewing the subsequently identified lesion locations, and the user's preference would be to show the marks on a corresponding FOR PRESENTATION image.</p> <p>The question arises as to whether or not the locations in terms of row and column offset can be applied to the corresponding FOR PRESENTATION image.</p> <p>There is no guarantee that some sort of spatial transformation has not been applied during the processing from FOR PROCESSING to FOR PRESENTATION, in which case the locations would not be the same. Currently, all known Digital Mammography "For Presentation" image Instances are geometrically equivalent to the corresponding Digital Mammography "For Processing" image Instances. Therefore, each pixel location recorded for a Digital Mammography "For Processing" image Instance will apply to the same pixel location in the corresponding Digital Mammography "For Presentation" image Instance. Future implementations may not follow this model.</p> <p>The proposal is to add a flag to Source Image Sequence references to indicate whether or not spatial locations are preserved during processing. Its applicability is generally and not confined to CAD.</p> <p>The reference is a "backward" reference from a FOR PRESENTATION image to a FOR PROCESSING predecessor only, since this is typically the order of processing and a forward reference might not be known. Also, the reference is in the images, not the CAD SR document, since the CAD system may have no knowledge of any FOR PRESENTATION images.</p>	
Sections of documents affected	
PS 3.3 C.7.6.1 as already amended by CP 474	
PS 3.6	
PS 3.17 Annex E	
Correction Wording:	

*Amend PS 3.3:*

**Table C.7-9  
 GENERAL IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
...			
Source Image Sequence	(0008,2112)	3	<p>A Sequence that identifies the set of Image SOP Class/Instance pairs of the Images that were used to derive this Image. Zero or more Items may be included in this Sequence.</p> <p>See C.7.6.1.1.4 for further explanation.</p>
>Include 'Image SOP Instance Reference Macro' Table 10-3			
>Purpose of Reference Code Sequence	(0040,A170)	3	<p>Describes the purpose for which the reference is made, that is what role the source image or frame(s) played in the derivation of this image. Only a single Item shall be permitted in this sequence.</p>
>>Include 'Code Sequence Macro' Table 8.8-1			Defined Context ID is 7202.
<b><u>&gt;Spatial Locations Preserved</u></b>	<b><u>(0028,135A)</u></b>	<b><u>3</u></b>	<p><b><u>Whether or not the spatial locations of all pixels are preserved during the processing of the source image that resulted in the current image.</u></b></p> <p><b><u>Enumerated Values: YES, NO</u></b></p> <p><b><u>Note: This applies not only to images with a known relationship to a 3D space, but also to projection images. For example, a projection radiograph such as a mammogram that is processed by a point image processing operation such as contrast enhancement, or a smoothing or edge enhancing convolution, would have a value of YES for this attribute. A projection radiograph that had been magnified or warped geometrically would have a value of NO for this attribute. This attribute is typically of importance in relating images with Presentation Intent Type (0008,0068) values of FOR PROCESSING and FOR PRESENTATION.</u></b></p>
...			

**Table C.8-68**  
**DX SERIES MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
...	...	...	...
Presentation Intent Type	(0008,0068)	1	Identifies the intent of the images that are contained within this Series.  Enumerated Values: FOR PRESENTATION FOR PROCESSING  See C.8.11.1.1.1 for further explanation.

**C.8.11.1.1 DX Series Attribute Descriptions**

**C.8.11.1.1.1 Presentation Intent Type**

Presentation Intent Type (0008,0068) shall identify the intent for the purposes of display or other presentation of all Images within this Series.

- Notes:
1. Since this is a Series level attribute, all Images within a Series have the same value for this Attribute.
  2. The intent of this restriction is to ensure that FOR PRESENTATION and FOR PROCESSING images are placed in separate Series, so that no confusion can arise as to which images are suitable for diagnostic reading as determined by local policy.

A Series of Images intended for viewing by an observer, after application of any grayscale transformations specified in the image object such as VOI LUT, shall have an Enumerated Value of FOR PRESENTATION.

- Notes:
1. These images may still be of Image Type (0008,0008) ORIGINAL rather than DERIVED despite the possibility that they may have undergone some processing, such as unsharp masking. In this case a DERIVED image would have undergone yet further processing to make it substantially different from the original. See Figure C.8-13.
  2. These images may still be subjected to processing or further processing, if appropriate, depending on the application.
  3. These images are intended for display on a device, without (further) processing, since that device may not be capable of image processing. The quality of the displayed image or its suitability for any purpose is beyond the scope of the DICOM Standard.

Images that have been corrected to account for characteristics of the detector but which are intended to be further processed before being displayed, shall have an Enumerated Value of FOR PROCESSING.

- Note:
- This type is provided to allow the functions of image acquisition and image processing for presentation to be separated and yet have images conveyed between the two processes using a DICOM object. Individual sites or users may choose to substitute their own specialized processing in place of that supplied by the implementor.
- Images available at this stage of processing may be useful for quality control and problem solving purposes, as well as academic research.
- Images of this type may also be archived, retrieved and processed with different algorithms or parameters in order to alter the appearance of specific features for clinical purposes.
- The nature of the detector correction that may have been applied before sending an image of type FOR PROCESSING is not specified. In particular, acquisitions that acquire several sets of matrices of pixel values (such as image data, gain offset and a defect map) must perform some processing (detector correction) before a DX Image object can be instantiated.

The nature of the processing that may have been applied before sending an image of type FOR PRESENTATION is also not specified.

It is expected that individual implementors will use Private Attributes to convey specifics of the processing applied that may be of use for further processing by those aware of the parameters and algorithms. The diversity of detector types and processing algorithms make it undesirable to standardize such parameters.

**Whether or not the spatial locations of all pixels are preserved during the processing of the source image that resulted in the current image can be indicated by Spatial Locations Preserved (0028,135A) in a Source Image Sequence (0008,2112) reference from the FOR PRESENTATION image to a FOR PROCESSING predecessor.**

If images from the same exposure exist with different Values of Presentation Intent Type (0008,0068), then they shall have different SOP Instance UIDs.

- Notes:
1. Source Image Sequence (0008,2112) may be used to relate these images.
  2. The SOP Class UIDs of the two images will also be different.

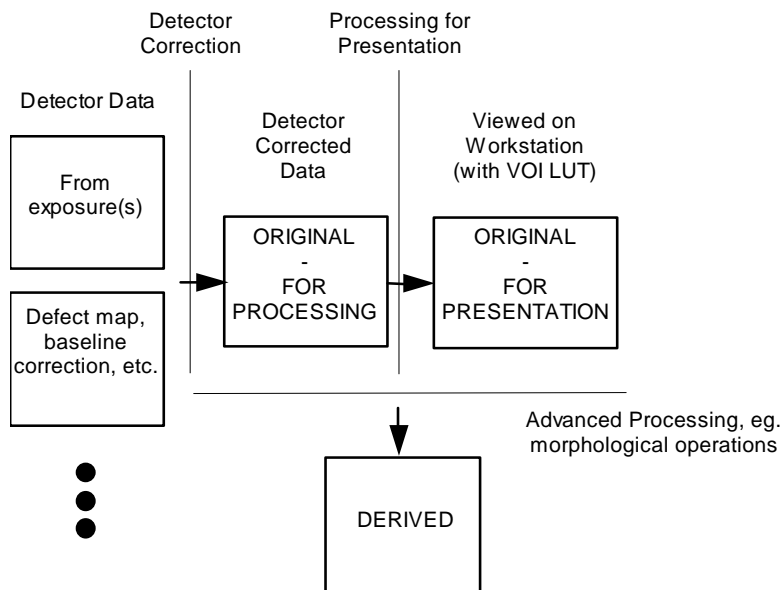


Figure C.8-13 - Explanation of Presentation Intent Type

Amend PS 3.6:

(0028,135A) Spatial Locations Preserved

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Add the following to PS 3.17, Annex E

## **E.x Mammography CAD SR AND For Processing / For Presentation IMAGES**

If a Mammography CAD SR Instance references Digital Mammography X-ray Image Storage – For Processing Instances, but a review workstation has access only to Digital Mammography X-Ray Image Storage – For Presentation Instances, the following steps are recommended in order to display such Mammography CAD SR content with Digital Mammography X-Ray Image – For Presentation Instances.

- In most scenarios, the Mammography CAD SR Instance is assigned to the same DICOM Patient and Study as the corresponding Digital Mammography “For Processing” and “For Presentation” image Instances.
- If a workstation has a Mammography CAD SR Instance, but does not have images for the same DICOM Patient and Study, the workstation may use the Patient and Study attributes of the Mammography CAD SR Instance in order to Query/Retrieve the Digital Mammography “For Presentation” images for that Patient and Study.
- Once a workstation has the Mammography CAD SR Instance and Digital Mammography “For Presentation” image Instances for the Patient and Study, the Source Image Sequence (0008,2112) attribute of each Digital Mammography “For Presentation” Instance will reference the corresponding Digital Mammography “For Processing” Instance. The workstation can match the referenced Digital Mammography “For Processing” Instance to a Digital Mammography “For Processing” Instance referenced in the Mammography CAD SR.
- The workstation should check for Spatial Locations Preserved (0028,135A) in the Source Image Sequence of each Digital Mammography “For Presentation” image Instance, to determine whether it is spatially equivalent to the corresponding Digital Mammography “For Processing” image Instance.
- If the value of Spatial Locations Preserved (0028,135A) is YES, then the CAD results should be displayed.
- If the value of Spatial Locations Preserved (0028,135A) is NO, then the CAD results should not be displayed.
- If Spatial Locations Preserved (0028,135A) is not present, whether or not the images are spatially equivalent is not known. If the workstation chooses to proceed with attempting to display CAD results, then compare the Image Library (see TID 4020) content item values of the Mammography CAD SR Instance to the associated attribute values in the corresponding Digital Mammography “For Presentation” image Instance. The content items (111044, DCM, “Patient Orientation Row”), (111043, DCM, “Patient Orientation Column”), (111025, DCM, “Horizontal Pixel Spacing”), and (111066, DCM, “Vertical Pixel Spacing”) may be used for this purpose. If the values do not match, the workstation needs to adjust the coordinates of the findings in the Mammography CAD SR content to match the spatial characteristics of the Digital Mammography “For Presentation” image Instance.