DICOM Correction Proposal

STATUS	Final Text
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Correction Number CP-1359
Log Summary: Clarify restrictions on icon images inside image IODs
Name of Standard PS 3.3 2013
Rationale for Correction: Historically, the Icon Image Sequence (0088,0200) has been introduced with Supplement 1, which also introduced the DICOM file format and the DICOMDIR data structures. Later on with CP-165, Icon Images have also been defined as part of the General Image Module, i.e. for all DICOM image IODs. A few years later, CP-413 clarified that the Image Pixel Macro should be used for the Icon Image Sequence's content (and not the Image Pixel Module – which does not change the original intent, though). The DICOM standard defines in PS 3.3-2011 Section C.7.6.1.1.6 that "the restrictions defined in Section F.7 shall apply" also to the General Image Module. Originally, this section with the title "ICON IMAGE KEY DEFINITION" was only applicable to the Icon Image Sequence being part of a Directory Record (i.e. of a DICOMDIR file). So, most sentences in this section seem to imply that they refer to a DICOMDIR or at least that they are used for a File- set Reader/Updater/Creator only. Especially, the wording "The Image Pixel Macro usage is restricted in a few areas to facilitate general use in Directory Record across various modality environments." (which can be traced back to Supplement 1) does not make clear that these restrictions also apply to the use in a DICOM image object (i.e. the General Image Module and other related modules). This CP proposes to explicitly list the applicable restrictions for image IODs in Section C.7.6.1.1.6 and to leave Section F.7 for Directory Records only. It also fixes some minor inconsistencies related to icon images.
Correction Wording:

Change PS 3.3 Section C.7.6.1.1.6

C.7.6.1.1.6 Icon Image Sequence

An Icon Image may be used as a key representative of an Image. It is defined as a Sequence that contains a single Item encapsulating the Data Set made of the Data Elements of the Icon Image. The Data Elements are defined by the Image Pixel Macro (see Section C.7.6.3). ~~**The restrictions defined in Section F.7 shall apply.**~~**Unless otherwise specified in the module or macro table where the Icon Image Sequence (0088,0200) is used, the following restrictions shall apply on the Image Pixel Macro usage:**

a. Only monochrome and palette color images shall be used. Samples per Pixel (0028,0002) shall have a Value of 1, Photometric Interpretation (0028,0004) shall have a Value of either MONOCHROME 1, MONOCHROME 2 or PALETTE COLOR, Planar Configuration (0028,0006) shall not be present

Note: True color icon images are not supported. This is due to the fact that the reduced size of the Icon Image makes the quality of a palette color image (with 256 colors) sufficient in most cases.

b. There is no explicite limitation on the size of an Icon Image specified by Rows (0028,0010) and Columns (0028,0011)

c. Pixel samples shall have a Value of either 1 or 8 for Bits Allocated (0028,0100) and Bits Stored (0028,0101). High Bit (0028,0102) shall have a Value of one less than the Value used in Bit Stored

d. Pixel Representation (0028,0103) shall specify an unsigned integer representation (Value 0000H)

e. Pixel Aspect Ratio (0028,0034) shall have a Value of 1:1

f. If a Palette Color lookup Table is used, Bits Allocated (0028,0100) shall have a Value of 8

Change PS 3.3 Section C.8.13.1

Table C.8-79
ENHANCED MR IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
[…]			
Icon Image Sequence	(0088,0200)	3	This icon image is representative of the Image. Only a single Item is permitted in this Sequence.
>Include 'Image Pixel Macro' Table C.7-11b			See **~~Section F.7~~C.7.6.1.1.6 for further explanation**.

Change PS 3.3 Section C.8.15.2

Table C.8-114
ENHANCED CT IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
[…]			
Icon Image Sequence	(0088,0200)	3	This icon image is representative of the Image. Only a single Item is permitted in this Sequence.
>Include 'Image Pixel Macro' Table C.7-11b			See **~~Section F.7~~C.7.6.1.1.6 for further explanation**.

Change PS 3.3 Section C.18.4

Table C.18.4-1
IMAGE REFERENCE MACRO ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
[…]			
>Icon Image Sequence	(0088,0200)	3	This Icon Image is representative of the Image. Only a single Item is permitted in this Sequence. The Icon Image **~~may~~shall** be no greater than 128 rows by 128 columns.
>> Include 'Image Pixel Macro' Table C.7-11b			See **~~Section F.7~~C.7.6.1.1.6 for further**

	explanation.

Change PS 3.3 Section C.22.1

Table C.22.1-1
MEDIA CREATION MANAGEMENT MODULE ATTRIBUTES

Attribute name	Tag	Attribute Description
[…]		
>Icon Image Sequence	(0088,0200)	This Icon Image is representative of the Image. **Only a single Item is permitted in this Sequence.**
*>> Include 'Image Pixel Macro' Table C.7-11~~.2~~***b**		**See C.7.6.1.1.6 for further explanation.**

Change PS 3.3 Section F.7

F.7 ICON IMAGE KEY DEFINITION

An Icon Image may be used as a key representative of an Image, RT Dose, **Spectroscopy, Raw Data,** or Series in a corresponding Directory Record to allow an application to display icons which enable a user to select one or more from amongst several of them. It is based on the general purpose Image Pixel Macro (See Annex C).

The Icon Image Key corresponds to Data Element (0088,0200). It is defined as a Sequence which contains a single Item encapsulating the Data Set made of the Data Elements of the Icon Image. The Data Elements are defined by the Image Pixel Macro (see Section C.7.6.3).

The Image Pixel Macro usage is restricted in a few areas to facilitate general use in Directory Record across various modality environments. These restrictions are:

a. Only monochrome and palette color images shall be used. Samples per Pixel (0028,0002) shall have a Value of 1, Photometric Interpretation (0028,0004) shall have a Value of either MONOCHROME 1, MONOCHROME 2 or PALETTE COLOR, Planar Configuration (0028,0006) shall not be present

Note: True color icon images are not supported. This is due to the fact that the reduced size of the Icon Image makes the quality of a palette color image (with 256 colors) sufficient in most cases. This simplifies the handling of Icon Images by File-set Readers and File-set Updaters.

b. If an FSR/FSU supports Icons (i.e. does not ignore them) then it shall support at least a maximum size of 64 by 64 Icons. An FSC may write Icons of any size. Icons larger than 64 by 64 may be ignored by FSRs and FSUs unless specialized by Application Profiles

c. Pixel samples **shall** have a Value of either 1 or 8 for Bits Allocated (0028,0100) and Bits Stored (0028,0101). High Bit (0028,0102) shall have a Value of one less than the Value used in Bit Stored

d. Pixel Representation (0028,0103) shall ~~**used**~~**specify** an unsigned integer representation (Value 0000H)

e. Pixel Aspect Ratio (0028,0034) shall have a Value of 1:1

f. If a Palette Color lookup Table is used, ~~**an 8**~~ Bit**s** Allocated (0028,0100) shall ~~**be used**~~**have a Value of 8**