DICOM Correction Proposal

<table>
<thead>
<tr>
<th>Status</th>
<th>Letter Ballot</th>
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<tr>
<td>Date of Last Update</td>
<td>2013/04/10</td>
</tr>
<tr>
<td>Person Assigned</td>
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<td>Submission Date</td>
<td>2012/10/11</td>
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<tr>
<th>Correction Number</th>
<th>CP-1263</th>
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<tr>
<td>Log Summary: Relax rescale restrictions for Multi-frame Grayscale Word IOD to allow use as parametric maps</td>
<td></td>
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<tr>
<td>Name of Standard</td>
<td>PS 3.3 2011</td>
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Rationale for Correction:
Non-modality-specific parametric maps, images whose pixel values represent some derived unit, in the absence of any other appropriate IOD, are often encoded as Secondary Capture images. Since these are often naturally multi-frame and need to contain spacing, positioning and orientation information correlated to the original cross-sectional images, the Enhanced Multi-Frame Secondary Capture objects are preferable to the single frame object. Frequently these need a Rescale Slope of other than 1 and/or a Rescale Intercept of other than 0, however, since they may represent scaled floating point values, such as over the range 0.0 to 1.0.

For this purpose, it is only necessary to amend the 16 bit gray scale IOD, and for this IOD, it is unlikely that the relaxation of the existing restrictions on the rescale values will have any negative impact in practice.

Correction Wording:
Amend PS 3.3 to move the rescale value restrictions from the module to the IOD, and constrain the byte but not word IOD

A.8.3.4 Multi-frame Grayscale Byte SC Image IOD Content Constraints
The VOI LUT module is required if the VOI LUT stage is not an identity transformation. Support for both window and LUT is mandatory. The output grayscale space is defined to be in P-Values.

Note: If the VOI LUT module is absent, then the stored pixel values are in P-Values.

In the Image Pixel Module, the following constraints apply:
- Samples per Pixel (0028,0002) shall be 1
- Photometric Interpretation (0028,0004) shall be MONOCROME2
- Bits Allocated (0028,0100) shall be 8
- Bits Stored (0028,0101) shall be 8
- High Bit (0028,0102) shall be 7
- Pixel Representation (0028,0103) shall be 0
- Planar Configuration (0028,0006) shall not be present
- Rescale Intercept shall be 0
- Rescale Slope shall be 1
- Rescale Type shall be US
The Overlay module shall not be present.
A.8.4.4 Multi-frame Grayscale Word SC Image IOD Content Constraints

The VOI LUT module is required if the VOI LUT stage is not an identity transformation. Support for both window and LUT is mandatory. The output grayscale space is defined to be in P-Values.

Note: If the VOI LUT module is absent, then the stored pixel values are in P-Values.

In the Image Pixel Module, the following constraints apply:

- Samples per Pixel (0028,0002) shall be 1
- Photometric Interpretation (0028,0004) shall be MONOCHROME2
- Bits Allocated (0028,0100) shall be 16
- Bits Stored (0028,0101) shall be greater than or equal to 9 and less than or equal to 16
- High Bit (0028,0102) shall be one less than Bits Stored (0028,0101)
- Pixel Representation (0028,0103) shall be 0
- Planar Configuration (0028,0006) shall not be present

Note: Rescale Slope and Rescale Intercept are not constrained in this IOD to any particular values. E.g., they may be used to recover floating point values scaled to the integer range of the stored pixel values. Rescale Slope may be less than one, e.g., a Rescale Slope of 1.0/65535 would allow represent floating point values from 0 to 1.0.

The Overlay module shall not be present. Unused high bits shall be filled with zeroes.

C.8.6.3 SC Multi-frame Image Module

Table C.8-25b contains IOD Attributes that describe SC Multi-frame images.

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Tag</th>
<th>Type</th>
<th>Attribute Description</th>
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<tbody>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Rescale Intercept</td>
<td>(0028,1052)</td>
<td>1C</td>
<td>The value b in the relationship between stored values (SV) in Pixel Data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. Enumerated Value: 0 Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Note: This specifies an identity Modality LUT transformation.</td>
</tr>
<tr>
<td>Rescale Slope</td>
<td>(0028,1053)</td>
<td>1C</td>
<td>m in the equation specified by Rescale Intercept (0028,1052). Enumerated Value: 1 Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Note: This specifies an identity Modality LUT transformation.</td>
</tr>
</tbody>
</table>
| Rescale Type | (0028,1054) | 1C | Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052).

**Defined Term:**
- US = Unspecified

**Enumerated Value:**
- Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.

**Note:** This specifies an identity Modality LUT transformation.

| … | … | … | … |