

DICOM Correction Item

Correction Number	CP 699
Log Summary: PS2 compression data elements reused for calibration	
Type of Modification	Name of Standard
Correction	PS 3.3,3.6 2006
<p>Rationale for Correction</p> <p>CP 586 introduced new data elements related to pixel spacing calibration, but unfortunately these had already been assigned for use in the (pre-DICOM) NEMA PS 2 compression standard, but not recorded as retired in the data dictionary. Though NEMA PS 2 is retired, this impacts existing toolkits and products that already make use of the old pre-DICOM compression mechanisms, and precludes support of the new pixel spacing calibration mechanism.</p> <p>See "ftp://medical.nema.org/medical/dicom/1989/PS2_1989.pdf"</p> <p>Replace the CP 586 data elements with different element numbers and explicitly record the PS 2 data elements as retired in the data dictionary.</p> <p>The tag Pixel Spacing Calibration Description is listed as group 0x0029 when it should be 0x0028.</p>	
Sections of documents affected	
PS 3.3 10.7	
PS 3.6	
Correction Wording:	

Update PS 3.3 10.7

10.7 BASIC PIXEL SPACING CALIBRATION MACRO

Table 10-10 defines the Attributes for the Basic Pixel Spacing Calibration Macro.

**Table 10-10
 BASIC PIXEL SPACING CALIBRATION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1C	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See 10.7.1.1.
Pixel Spacing Calibration Type	(0028, 04020A 02)	3	The type of correction for the effect of geometric magnification or calibration against an object of known size, if any. See 10.7.1.2.
Pixel Spacing Calibration Description	(002 98,04040 A04)	1C	A free text description of the type of correction or calibration performed. Notes: 1. In the case of correction, the text might include description of the assumptions made about the body part and geometry and depth within the patient. 2. in the case of calibration, the text might include a description of the fiducial and where it is located (e.g., "XYZ device applied to the skin over the greater trochanter"). 3. Though it is not required, the Device Module may be used to describe the specific characteristics and size of the calibration device. Required if Pixel Spacing Calibration Type (0028, 04020A 02) is present.

10.7.1 Basic Pixel Spacing Calibration Macro Attribute Descriptions

10.7.1.1 Pixel Spacing

The Pixel Spacing (0028,0030) attribute specifies the physical distance in the patient between the center of each pixel.

If the image has not been calibrated to correct for the effect of geometric magnification, the values of this attribute shall be the same as in Imager Pixel Spacing (0018,1164) or Nominal Scanned Pixel Spacing (0018,2010), if either of those attributes are present.

If the values are different from those in Imager Pixel Spacing (0018,1164) or Nominal Scanned Pixel Spacing (0018,2010), then the image has been corrected for known or assumed geometric magnification or calibrated with respect to some object of known size at known depth within the patient.

If Pixel Spacing Calibration Type (0028,~~04020A~~**02**) and Imager Pixel Spacing (0018,1164) and Nominal Scanned Pixel Spacing (0018,2010) are absent, then it cannot be determined whether or not correction or calibration have been performed.

- Notes: 1. Imager Pixel Spacing (0018,1164) is a required attribute in DX family IODs.
2. Nominal Scanned Pixel Spacing (0018,2010) is a required attribute in Multi-frame SC family IODs

10.7.1.2 Pixel Spacing Calibration Type

The Pixel Spacing Calibration Type (0028,~~04020A02~~) attribute The type of correction for the effect of geometric magnification or calibration against an object of known size, if any.

Enumerated Values:

- GEOMETRY the Pixel Spacing (0028,0030) values account for assumed or known geometric magnification effects and correspond to some unspecified depth within in the patient; the Pixel Spacing (0028,0030) values may thus be used for measurements of objects located close to the central ray and at the same depth.
- FIDUCIAL the Pixel Spacing (0028,0030) values have been calibrated by the operator or image processing software by measurement of an object (fiducial) that is visible in the pixel data and is of known size and is located close to the central ray; the Pixel Spacing (0028,0030) values may thus be used for measurements of objects located close to the central ray and located at the same depth within the patient as the fiducial

Update PS 3.6 Sections 5 and 6

5 Conventions

Word(s) are capitalized in this document to help the reader understand that these word(s) have been previously defined in Section 3 and are to be interpreted with that meaning.

A Data Element Tag is represented as (gggg,eeee), where gggg equates to the Group Number and eeee equates to the Element Number within that Group. Data Element Tags are represented in hexadecimal notation as specified for each named Data Element in this Standard.

Where an "x" is shown in a group or element number, it means all values from 0 through F inclusive.

"RET" is used to indicate that the corresponding Data Element, SOP Class, or Transfer Syntax has been retired. Retired items are shown italicized.

- Note: The use of retired items is supported in this version of DICOM. However, new implementations are strongly encouraged to implement alternative Data Elements, SOP Classes or Transfer Syntaxes.

6 Registry of DICOM data elements

Note: For attributes that were present in ACR-NEMA 1.0 and 2.0 and that have been retired, the specifications of Value Representation and Value Multiplicity provided are recommendations for the purpose of interpreting their values in objects created in accordance with earlier versions of this standard. These recommendations are suggested as most appropriate for a particular attribute; however, there is no guarantee that historical objects will not violate some requirements or specified VR and/or VM.

(0028,0051)	Corrected Image	CS	1-n	
<u>(0028,005F)</u>	<u>Compression Recognition Code</u>	<u>LO</u>	<u>1</u>	<u>RET</u>
(0028,0060)	Compression Code	CS	1	RET
<u>(0028,0061)</u>	<u>Compression Originator</u>	<u>SH</u>	<u>1</u>	<u>RET</u>
<u>(0028,0062)</u>	<u>Compression Label</u>	<u>LO</u>	<u>1</u>	<u>RET</u>
<u>(0028,0063)</u>	<u>Compression Description</u>	<u>SH</u>	<u>1</u>	<u>RET</u>
<u>(0028,0065)</u>	<u>Compression Sequence</u>	<u>CS</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0066)</u>	<u>Compression Step Pointers</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0068)</u>	<u>Repeat Interval</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0069)</u>	<u>Bits Grouped</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0070)</u>	<u>Perimeter Table</u>	<u>US</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0071)</u>	<u>Perimeter Value</u>	<u>US or SS</u>	<u>1</u>	<u>RET</u>
<u>(0028,0080)</u>	<u>Predictor Rows</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0081)</u>	<u>Predictor Columns</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0082)</u>	<u>Predictor Constants</u>	<u>US</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0090)</u>	<u>Blocked Pixels</u>	<u>CS</u>	<u>1</u>	<u>RET</u>
<u>(0028,0091)</u>	<u>Block Rows</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0092)</u>	<u>Block Columns</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0093)</u>	<u>Row Overlap</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0094)</u>	<u>Column Overlap</u>	<u>US</u>	<u>1</u>	<u>RET</u>
(0028,0100)	Bits Allocated	US	1	
...
(0028,0301)	Burned In Annotation	CS	1	
<u>(0028,0400)</u>	<u>Transform Label</u>	<u>LO</u>	<u>1</u>	<u>RET</u>
<u>(0028,0401)</u>	<u>Transform Version Number</u>	<u>LO</u>	<u>1</u>	<u>RET</u>
<u>(0028,0402)</u>	<u>Number of Transform Steps</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0403)</u>	<u>Sequence of Compressed Data</u>	<u>LO</u>	<u>1-n</u>	<u>RET</u>

<u>(0028,0404)</u>	<u>Details of Coefficients</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,04x0)</u>	<u>Rows For Nth Order Coefficients</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,04x1)</u>	<u>Columns For Nth Order Coefficients</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,04x2)</u>	<u>Coefficient Coding</u>	<u>LO</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,04x3)</u>	<u>Coefficient Coding Pointers</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0700)</u>	<u>DCT Label</u>	<u>LO</u>	<u>1</u>	<u>RET</u>
<u>(0028,0701)</u>	<u>Data Block Description</u>	<u>CS</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0702)</u>	<u>Data Block</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0710)</u>	<u>Normalization Factor Format</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0720)</u>	<u>Zonal Map Number Format</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0721)</u>	<u>Zonal Map Location</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,0722)</u>	<u>Zonal Map Format</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0730)</u>	<u>Adaptive Map Format</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,0740)</u>	<u>Code Number Format</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,08x0)</u>	<u>Code Label</u>	<u>CS</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,08x2)</u>	<u>Number of Table</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,08x3)</u>	<u>Code Table Location</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(0028,08x4)</u>	<u>Bits For Code Word</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(0028,08x8)</u>	<u>Image Data Location</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
(0028, <u>04020A02</u>)	Pixel Spacing Calibration Type	CS	1	
(0028, <u>04040A04</u>)	Pixel Spacing Calibration Description	LO	1	
(0028,1040)	Pixel Intensity Relationship	CS	1	
(0028,1041)	Pixel Intensity Relationship Sign	SS	1	
...
<u>(1000,xxx0)</u>	<u>Escape Triplet</u>	<u>US</u>	<u>3</u>	<u>RET</u>
<u>(1000,xxx1)</u>	<u>Run Length Triplet</u>	<u>US</u>	<u>3</u>	<u>RET</u>
<u>(1000,xxx2)</u>	<u>Huffman Table Size</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(1000,xxx3)</u>	<u>Huffman Table Triplet</u>	<u>US</u>	<u>3</u>	<u>RET</u>
<u>(1000,xxx4)</u>	<u>Shift Table Size</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(1000,xxx5)</u>	<u>Shift Table Triplet</u>	<u>US</u>	<u>3</u>	<u>RET</u>
...
<u>(1010,xxxx)</u>	<u>Zonal Map</u>	<u>US</u>	<u>1-n</u>	<u>RET</u>

...
(60xx,0052)	Overlay Plane Origin	US	1	
(60xx,0060)	Overlay Compression Code	CS	1	RET
<u>(60xx,0061)</u>	<u>Overlay Compression Originator</u>	<u>SH</u>	<u>1</u>	<u>RET</u>
<u>(60xx,0062)</u>	<u>Overlay Compression Label</u>	<u>SH</u>	<u>1</u>	<u>RET</u>
<u>(60xx,0063)</u>	<u>Overlay Compression Description</u>	<u>CS</u>	<u>1</u>	<u>RET</u>
<u>(60xx,0066)</u>	<u>Overlay Compression Step Pointers</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(60xx,0068)</u>	<u>Overlay Repeat Interval</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(60xx,0069)</u>	<u>Overlay Bits Grouped</u>	<u>US</u>	<u>1</u>	<u>RET</u>
(60xx,0100)	Overlay Bits Allocated	US	1	
(60xx,0102)	Overlay Bit Position	US	1	
(60xx,0110)	Overlay Format	CS	1	RET
(60xx,0200)	Overlay Location	US	1	RET
<u>(60xx,0800)</u>	<u>Overlay Code Label</u>	<u>CS</u>	<u>1-n</u>	<u>RET</u>
<u>(60xx,0802)</u>	<u>Overlay Number of Tables</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(60xx,0803)</u>	<u>Overlay Code Table Location</u>	<u>AT</u>	<u>1-n</u>	<u>RET</u>
<u>(60xx,0804)</u>	<u>Overlay Bits For Code Word</u>	<u>US</u>	<u>1</u>	<u>RET</u>
(60xx,1001)	Overlay Activation Layer	CS	1	
...
(7FE0,0010)	Pixel Data	OW or OB	1	
<u>(7FE0,0020)</u>	<u>Coefficients SDVN</u>	<u>OW</u>	<u>1</u>	<u>RET</u>
<u>(7FE0,0030)</u>	<u>Coefficients SDHN</u>	<u>OW</u>	<u>1</u>	<u>RET</u>
<u>(7FE0,0040)</u>	<u>Coefficients SDDN</u>	<u>OW</u>	<u>1</u>	<u>RET</u>
<u>(7Fxx,0010)</u>	<u>Variable Pixel Data</u>	<u>OW or OB</u>	<u>1</u>	<u>RET</u>
<u>(7Fxx,0011)</u>	<u>Variable Next Data Group</u>	<u>US</u>	<u>1</u>	<u>RET</u>
<u>(7Fxx,0020)</u>	<u>Variable Coefficients SDVN</u>	<u>OW</u>	<u>1</u>	<u>RET</u>
<u>(7Fxx,0030)</u>	<u>Variable Coefficients SDHN</u>	<u>OW</u>	<u>1</u>	<u>RET</u>
<u>(7Fxx,0040)</u>	<u>Variable Coefficients SDDN</u>	<u>OW</u>	<u>1</u>	<u>RET</u>