

## DICOM Correction Proposal

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| STATUS              | Final Text  |
| Date of Last Update | 2014/04/01  |
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| Submission Date     | 2013/02/03  |

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|--|---------|
| Correction Number  | CP-1282 |
| Log Summary: Value Multiplicity of Positioner Increments in 3D X-Ray and Breast Tomo   |         |
| Name of Standard<br>PS 3.3, 3.6 2011   |         |
| Rationale for Correction:<br>The 3D X-Ray model of positioners uses different attributes but references the same sections for the model as used in the earlier IODs (i.e., references C.8.7.5.1.2)<br>The Primary and Secondary Positioner Increment attributes of the X-Ray 3D General Positioner Movement Macro (with VM=1) are different from the Positioner Primary and Secondary Angle Increment attributes of the XA Positioner Module (with VM=1-n). A new section is needed to describe how to use these attributes.<br>In the X-Ray 3D Angiographic Image, when the primary or secondary positioner increments are not constant within the acquisition context, the Positioner Primary and Secondary Angles shall be added to the Per Projection Acquisition Sequence (0018,9538) in order to be encoded for each projection. |         |
| Correction Wording:  |         |

|                                   |
|-----------------------------------|
| <b>For reference from PS 3.6:</b> |
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|             |                                      |                                   |    |     |
|-------------|--------------------------------------|-----------------------------------|----|-----|
| (0018,1520) | Positioner Primary Angle Increment   | PositionerPrimaryAngleIncrement   | DS | 1-n |
| (0018,1521) | Positioner Secondary Angle Increment | PositionerSecondaryAngleIncrement | DS | 1-n |
| (0018,9514) | Primary Positioner Increment         | PrimaryPositionerIncrement        | FL | 1   |
| (0018,9515) | Secondary Positioner Increment       | SecondaryPositionerIncrement      | FL | 1   |

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| <b>Amend PS 3.3 C.8.21.3.1.3:</b> |
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### C.8.21.3.1.3 X-Ray 3D General Positioner Movement Macro

Table C.8.21.3.1.3-1 describes the X-Ray 3D General Positioner Movement Macro that specifies the Attributes that describe the movement of a positioner during the acquisition of more than one projection.

**Table C.8.21.3.1.3-1  
X-RAY 3D GENERAL POSITIONER MOVEMENT MACRO**

| <b>Attribute Name</b>                    | <b>Tag</b>         | <b>Type</b> | <b>Attribute Description</b>   |
|--|--------------------|-------------|--|
| Primary Positioner Scan Arc              | (0018,9508)        | 1C          | Total amount of rotation of the primary positioner in degrees.<br>Required if present and consistent in the contributing SOP Instances. Required if Modality (0008,0060) is MG.  |
| Primary Positioner Scan Start Angle      | (0018,9510)        | 1C          | Start position of the primary positioner in degrees. See C.8.7.5.1.2 or C.8.11.7, depending on modality and positioner type.<br>Required if present and consistent in the contributing SOP Instances. Required if Modality (0008,0060) is MG.  |
| Primary Positioner Increment             | (0018,9514)        | 1C          | <b>Constant</b> increment of the primary positioner angle in degrees. Positive <b>increment values</b> indicates <b>an increasing value of the primary positioner angle moving from RAO to LAO position through the anterior, or right to vertical.</b><br>See C.8.7.5.1.2 or C.8.11.7, <b>for the sign conventions</b> depending on modality and positioner type.<br>See <b>C.8.21.3.1.3.1 for further explanation.</b><br>Required if present and consistent in the contributing SOP Instances. <b>Required if Modality (0008,0060) is MG.</b> |
| <b>Primary Positioner Increment Sign</b> | <b>(0018,9518)</b> | <b>3</b>    | <b>Direction of the primary positioner rotation.</b><br><b>Defined terms:</b><br><b>+1: indicates a positive primary positioner angle increment.</b><br><b>-1: indicates a negative primary positioner angle increment.</b><br><b>See C.8.7.5.1.2 or C.8.11.7 for the sign conventions depending on modality and positioner type.</b><br><b>See C.8.21.3.1.3.1 for further explanation.</b>  |
| Secondary Positioner Scan Arc            | (0018,9509)        | 1C          | Total amount of rotation of the secondary positioner in degrees.<br>Required if present and consistent in the contributing SOP Instances.  |
| Secondary Positioner Scan Start Angle    | (0018,9511)        | 1C          | Start position of the secondary positioner in degrees. See C.8.7.5.1.2 or C.8.11.7, depending on modality and positioner type.<br>Required if present and consistent in the contributing SOP Instances.  |
| Secondary Positioner Increment           | (0018,9515)        | 1C          | <b>Constant</b> increment of the secondary positioner angle in degrees. Positive <b>increment values</b> indicates <b>an</b>   |

|   |                           |                 |  |
|---|---------------------------|-----------------|--|
|   |                           |                 | <p><b>increasing value of the secondary positioner angle moving from CAU to CRA position through the anterior, or from anterior to posterior.</b></p> <p>See C.8.7.5.1.2 or C.8.11.7, <b>for the sign conventions</b> depending on modality and positioner type.</p> <p>See <b>C.8.21.3.1.3.1 for further explanation.</b></p> <p>Required if present and consistent in the contributing SOP Instances.</p>  |
| <b><u>Secondary Positioner Increment Sign</u></b> | <b><u>(0018,9519)</u></b> | <b><u>3</u></b> | <p><b><u>Direction of the secondary positioner rotation.</u></b></p> <p><b><u>Defined terms:</u></b></p> <p><b><u>+1: indicates a positive secondary positioner angle increment.</u></b></p> <p><b><u>-1: indicates a negative secondary positioner angle increment.</u></b></p> <p><b><u>See C.8.7.5.1.2 or C.8.11.7 for the sign conventions depending on modality and positioner type.</u></b></p> <p><b><u>See C.8.21.3.1.3.1 for further explanation.</u></b></p> |

**C.8.21.3.1.3.1 Positioner Angle Increments**

**If the increments of the positioner angles are constant during the acquisition of the X-Ray projections, the attributes Primary Positioner Increment (0018,9514) and the Secondary Positioner Increment (0018,9515) describe this angular change between projections.**

**If the change in positioner angle is not constant between the projections, omit the Positioner Angle Increment attributes and record the individual positioner angle values in the Positioner Angle attributes within each Item of the Per Projection Acquisition Sequence (0018,9538). In such case, the attributes Primary Positioner Increment Sign (0018,9518) and Secondary Positioner Increment Sign (0018,9519) are used to describe the direction of the positioner rotation.**

**Amend PS 3.3 C.8.21.3.2:**

**C.8.21.3.2 X-Ray 3D Angiographic Acquisition Module**

This section describes the X-Ray 3D Angiographic Acquisition Module.

**Table C.8.21.3.2-1  
X-RAY 3D ANGIOGRAPHIC ACQUISITION MODULE ATTRIBUTES**

| <b>Attribute Name</b>                            | <b>Tag</b>                | <b>Type</b>     | <b>Attribute Description</b>  |
|--|---------------------------|-----------------|---|
| X-Ray 3D Acquisition Sequence                    | (0018,9507)               | 1               | Each item represents an acquisition context related to one or more reconstructions.<br>The values of the Acquisition Index (0020,9518) attribute may be used as index to Items in this sequence.<br>One or more Items shall be included in this sequence. |
| ...  |                           |                 |   |
| >Per Projection Acquisition Sequence             | (0018,9538)               | 1C              | Sequence containing detailed acquisition context of each individual projection used in this acquisition context.<br>One or more Items shall be included in this sequence.<br>Required if present and consistent in the contributing SOP Instances.        |
| ...  |                           |                 |   |
| >>Positioner Isocenter Primary Angle             | (0018,9463)               | 1C              | Position of the X-Ray center beam for this projection in the isocenter reference system in the X direction (deg).<br>See C.8.19.6.13.1.2 for further explanation.<br>Required if present and consistent in the contributing SOP Instances.                |
| >>Positioner Isocenter Secondary Angle           | (0018,9464)               | 1C              | Position of the X-Ray center beam for this projection in the isocenter reference system in the Z direction (deg).<br>See C.8.19.6.13.1.2 for further explanation.<br>Required if present and consistent in the contributing SOP Instances.                |
| >>Positioner Isocenter Detector Rotation Angle   | (0018,9465)               | 1C              | Rotation of the X-Ray detector plane for this projection (deg).<br>See C.8.19.6.13.1.2 for further explanation.<br>Required if present and consistent in the contributing SOP Instances.  |
| <b><u>&gt;&gt;Positioner Primary Angle</u></b>   | <b><u>(0018,1510)</u></b> | <b><u>3</u></b> | <b><u>Position of the X-Ray Image Intensifier about the patient from the RAO to LAO direction where movement from RAO to vertical is positive.</u></b><br><b><u>See C.8.7.5.1.2 for further explanation.</u></b>  |
| <b><u>&gt;&gt;Positioner Secondary Angle</u></b> | <b><u>(0018,1511)</u></b> | <b><u>3</u></b> | <b><u>Position of the X-Ray Image Intensifier about the patient from the CAU to CRA direction where movement from CAU to vertical is positive.</u></b><br><b><u>See C.8.7.5.1.2 for further explanation.</u></b>  |

### C.8.7.5.1.2 Positioner Primary and Secondary Angles

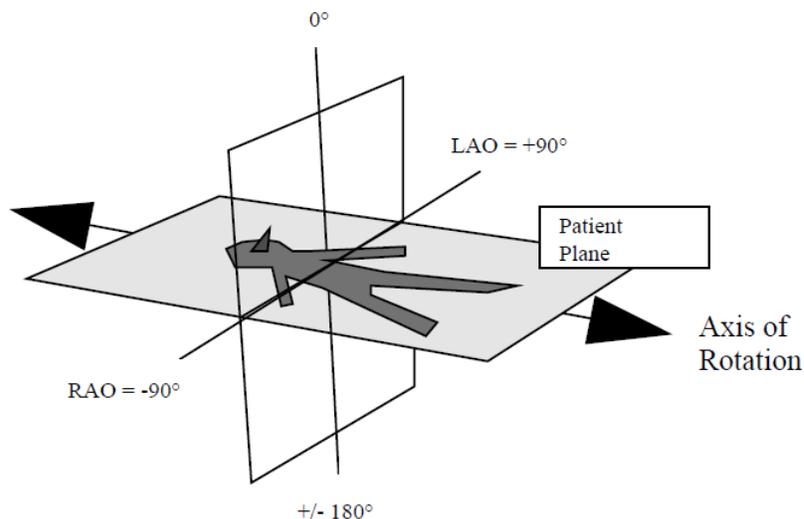
The definitions of Positioner Angles shall be with respect to the patient as illustrated in Figures C.8-11 and C.8-12. Zero degree is referenced to the origin perpendicular to the patient's chest. The Positioner Primary Angle definition is like longitude (in the equatorial plan); the Positioner Secondary Angle definition is like latitude (in the sagittal plane). The Positioner Angle attributes apply to the first frame of a multi-frame image. The valid range of Primary Positioner Angle is -180 to +180 degrees and the Secondary Positioner Angle range is -90 to +90 degrees.

The Patient Plane is defined by the isocenter of the imaging device and slices through the patient such that it is perpendicular to the sagittal plane of the body. The Primary Axis of rotation is defined at the intersection of the Patient Plane and of the Sagittal Plane. The Positioner Primary Angle is defined in the transaxial plane at the isocenter with zero degrees in the direction perpendicular to the patient's chest and +90 degrees at the Patient left hand side (LAO) and -90 at the Patient right hand side (RAO). The valid range of Primary Positioner Angle is -180 to +180 degrees.

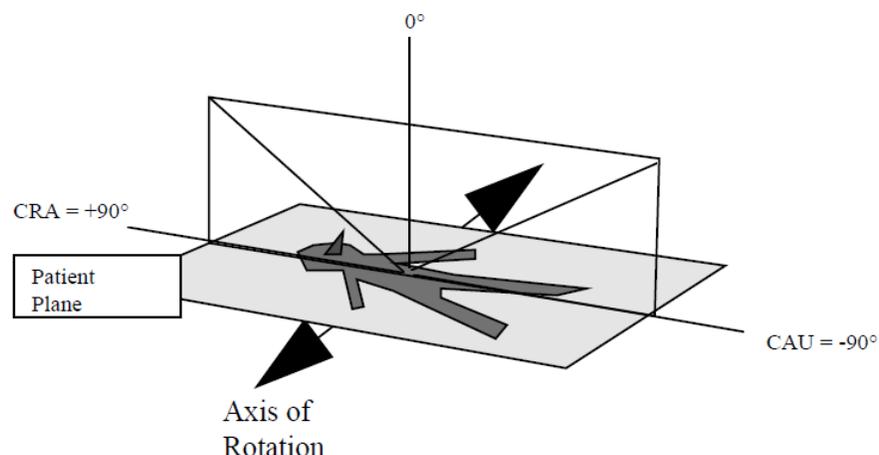
The Secondary Axis is in the Patient Plane and is perpendicular to the Primary Axis at the isocenter. The Positioner Secondary Angle is defined in the Sagittal Plane at the isocenter with zero degrees in the direction perpendicular to the patient's chest. +90 degrees corresponds to the cranial direction. The Secondary Positioner Angle range is -90 to +90 degrees.

At a 0 angle for both the Primary Angle (0018,1510) and Secondary Angle (0018,1511), the patient faces the Image Intensifier.

The Positioner Primary Angle (0018,1510) and Secondary Angle (0018,1511) apply to the first frame of a multi-frame image.



**Figure C.8-11**  
**Positioner Primary Angle**



**Figure C.8-12  
Positioner Secondary Angle**

### C.8.7.5.1.3 Positioner Angle Increments

If the positioner angles change during acquisition of a multi-frame image, the Positioner Angle Increment attributes describe the angular change per frame.

If the change in positioner angle is nominally constant for each frame, these fields may contain a single value of the average angular change per frame. Alternatively, the fields may contain a vector of offsets from the (initial) Positioner Angle attributes, with one value for each frame in the multi-frame image. The number of values in the Positioner Angle Increment attributes must be one, or must be equal to the Number of Frames attribute (0028,0008) in the Multi-Frame Module (see Section C.7.6.6).

Note: It is permissible to generate a vector of the absolute positioner angles in the Positioner Angle Increment attributes, and set the Positioner Primary and Secondary Angle attributes to value 0.

### C.8.7.5.1.4 Detector Primary and Secondary Angles

Detector Angles are defined in a fashion similar to the positioner angles, except that the angle of the central x-ray beam vector is relative to the detector plane rather than the patient plane. The central x-ray beam vector is defined as the vector from the x-ray source through the isocenter to the detector plane. Zero degree is referenced to the normal to the detector plane pointing away from the x-ray source. The Detector Angle attributes apply to the first frame of a multi-frame image. The valid range of the Detector Angles is -90 to + 90 degrees.

The Primary Axis of rotation is defined along the line in the column direction of the detector plane which intersects the central x-ray beam vector. The Detector Primary Angle is defined in the plane perpendicular to the Primary Axis of rotation at the point where the central x-ray beam vector intersects the detector plane, with zero degrees in the direction normal to the detector plane and -90 degrees at the left hand side of the image (i.e., toward column 1) and +90 at the right hand side of the image (i.e., toward the highest numbered column). The valid range of Primary Detector Angle is -90 to +90 degrees.

The Secondary Axis is in the detector plane and is perpendicular to the Primary Axis at the intersection of the beam vector with the detector plane (i.e., it is along the row direction). The Detector Secondary Angle is defined in the plane perpendicular to the Secondary Axis at the point where the central x-ray beam vector intersects the detector plane, with zero degrees in the direction normal to the detector plane. +90 degrees corresponds to the direction toward the top of the image. The Secondary Detector Angle range is -90 to + 90 degrees.

**For reference PS 3.3 C.8.11.7.1.2:**

### C.8.11.7.1.2 Detector Primary and Secondary Angles

Detector Angles are defined in a fashion similar to the positioner angles, except that the angle of the x-ray beam vector is relative to the detector plane rather than the patient plane. Zero degrees is referenced to the normal of the detector plane pointing toward the x-ray source. The valid range of the Detector Angles is -90 to + 90 degrees.

The Primary Axis of rotation is defined along the line in the column direction of the detector plane which intersects the x-ray beam vector. The Detector Primary Angle is defined in the plane perpendicular to the Primary Axis of rotation at the point where the x-ray beam vector intersects the detector plane, with zero degrees in the direction normal to the detector plane and +90 in the direction of the higher numbered columns of the detector in that plane. The valid range of Detector Primary Angle is -90 to +90 degrees.

The Secondary Axis is in the detector plane and is perpendicular to the Primary Axis at the intersection of the beam vector with the detector plane (i.e., it is along the row direction). The Detector Secondary Angle is defined in the plane perpendicular to the Secondary Axis at the point where the x-ray beam vector intersects the detector plane, with zero degrees in the direction normal to the detector plane. +90 degrees corresponds to the direction of the lower numbered rows of the detector in that plane. The Detector Secondary Angle range is -90 to + 90 degrees.

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| <b>Amend PS 3.6, Section 6</b> |
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| <b>Tag</b>                | <b>Name</b>                                       | <b>Keyword</b>                                 | <b>VR</b>        | <b>VM</b>       |
|---------------------------|---|--|------------------|-----------------|
| <b><u>(0018,9518)</u></b> | <b><u>Primary Positioner Increment Sign</u></b>   | <b><u>PrimaryPositionerIncrementSign</u></b>   | <b><u>SS</u></b> | <b><u>1</u></b> |
| <b><u>(0018,9519)</u></b> | <b><u>Secondary Positioner Increment Sign</u></b> | <b><u>SecondaryPositionerIncrementSign</u></b> | <b><u>SS</u></b> | <b><u>1</u></b> |