

## C.8.2 CT Modules

This Section describes the CT Image Module. This Module contains all Attributes that are specific to CT images.

### C.8.2.1 CT Image Module

The table in this Section contains IOD Attributes that describe CT images.

**Table C.8-3**  
**CT IMAGE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Image identification characteristics. See C.8.2.1.1.1 for specialization.
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. See C.8.2.1.1.2 for specialization.
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data. See C.8.2.1.1.3 for specialization.
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See C.8.2.1.1.4 for specialization.
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See C.8.2.1.1.5 for specialization.
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See C.8.2.1.1.6 for specialization.
Rescale Intercept	(0028,1052)	1	The value b in relationship between stored values (SV) and the output units. Output units = m*SV+b If Image Type (0008,0008) Value 1 is ORIGINAL and Value 3 is not LOCALIZER, output units shall be Hounsfield Units (HU).
Rescale Slope	(0028,1053)	1	m in the equation specified in Rescale Intercept (0028,1052).
Rescale Type	(0028,1054)	1C	Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). See C.11.1.1.2 for Defined Terms and further explanation. Required if the Rescale Type is not HU (Hounsfield Units). May be present otherwise.
KVP	(0018,0060)	2	Peak kilo voltage output of the x-ray generator used
Acquisition Number	(0020,0012)	2	A number identifying the single continuous gathering of data over a

			period of time which resulted in this image
Scan Options	(0018,0022)	3	Parameters of scanning sequence.
Data Collection Diameter	(0018,0090)	3	The diameter in mm of the region over which data were collected
Data Collection Center (Patient)	(0018,9313)	3	The x, y, and z coordinates (in the patient coordinate system) in mm of the center of the region in which data were collected. See C.8.15.3.6.1.
Reconstruction Diameter	(0018,1100)	3	Diameter in mm of the region from within which data were used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region.
Reconstruction Target Center (Patient)	(0018,9318)	3	The x, y, and z coordinates (in the patient coordinate system) of the reconstruction center target point as used for reconstruction in mm. See C.8.15.3.6.1. Note: If the reconstructed image is not magnified or panned the value corresponds with the Data Collection Center (Patient) (0018,9313) attribute.
Distance Source to Detector	(0018,1110)	3	Distance in mm from source to detector center. Note: This value is traditionally referred to as Source Image Receptor Distance (SID).
Distance Source to Patient	(0018,1111)	3	Distance in mm from source to isocenter (center of field of view). Note: This value is traditionally referred to as Source Object Distance (SOD).
Gantry/Detector Tilt	(0018,1120)	3	Nominal angle of tilt in degrees of the scanning gantry. Not intended for mathematical computations.
Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation; below the center is positive.
Rotation Direction	(0018,1140)	3	Direction of rotation of the source when relevant, about nearest principal axis of equipment. Enumerated Values: CW = clockwise CC = counter clockwise
Exposure Time	(0018,1150)	3	Time of x-ray exposure in msec. If Acquisition Type (0018,9302) equals SPIRAL, the value of this attribute shall be Revolution Time (0018,9305) divided by the Spiral Pitch Factor (0018,9311). See C.8.15.3.8.1 and C.8.15.3.2.1.

X-Ray Tube Current	(0018,1151)	3	X-Ray Tube Current in mA.
Exposure	(0018,1152)	3	The exposure expressed in mAs, for example calculated from Exposure Time and X-Ray Tube Current.
Exposure in $\mu$ As	(0018,1153)	3	The exposure expressed in $\mu$ As, for example calculated from Exposure Time and X-Ray Tube Current.
Filter Type	(0018,1160)	3	Label for the type of filter inserted into the x-ray beam.
Generator Power	(0018,1170)	3	Power in kW to the x-ray generator.
Focal Spot	(0018,1190)	3	Size of the focal spot in mm. For devices with variable focal spot or multiple focal spots, small dimension followed by large dimension.
Convolution Kernel	(0018,1210)	3	A label describing the convolution kernel or algorithm used to reconstruct the data
Revolution Time	(0018,9305)	3	The time in seconds of a complete revolution of the source around the gantry orbit.
Single Collimation Width	(0018,9306)	3	The width of a single row of acquired data (in mm). Note: Adjacent physical detector rows may have been combined to form a single effective acquisition row.
Total Collimation Width	(0018,9307)	3	The width of the total collimation (in mm) over the area of active x-ray detection. Note: This will be equal the number of effective detector rows multiplied by single collimation width.
Table Speed	(0018,9309)	3	The distance in mm that the table moves in one second during the gathering of data that resulted in this image.
Table Feed per Rotation	(0018,9310)	3	Motion of the table (in mm) during a complete revolution of the source around the gantry orbit.
Spiral Pitch Factor	(0018,9311)	3	Ratio of the Table Feed per Rotation (0018,9310) to the Total Collimation Width (0018,9307).
Exposure Modulation Type	(0018,9323)	3	A label describing the type of exposure modulation used for the purpose of limiting the dose. Defined Terms: NONE
Estimated Dose Saving	(0018,9324)	3	A percent value of dose saving due to the use of Exposure Modulation Type (0018,9323). A negative percent value of dose savings reflects an increase of exposure.

CTDI <sub>vol</sub>	(0018,9345)	3	Computed Tomography Dose Index (CTDI <sub>vol</sub> ), in mGy according to IEC 60601-2-44, Ed.2.1 (Clause 29.1.103.4), The Volume CTDI <sub>vol</sub> . It describes the average dose for this image for the selected CT conditions of operation.
CTDI Phantom Type Code Sequence	(0018,9346)	3	The type of phantom used for CTDI measurement according to IEC 60601-2-44.  Only a single Item is permitted in this Sequence.
<i>&gt;Include Code Sequence Macro Table 8.8-1</i>			<i>Defined CID 4052</i>
<i>Include 'General Anatomy Optional Macro' Table 10-7</i>			Defined Context ID for the Anatomic Region Sequence is CID 4030.
Calcium Scoring Mass Factor Patient	(0018,9351)	3	The calibration factor for the calcium mass score. These factors incorporate the effects of <ul style="list-style-type: none"> <li>• KV value of the CT image</li> <li>• the patient size.</li> <li>• machine specific corrections</li> </ul> See C.8.2.1.1.7.
Calcium Scoring Mass Factor Device	(0018,9352)	3	The calibration factors for the calcium mass score of the device. These factors incorporate the effects of <ul style="list-style-type: none"> <li>• KV value of the CT image</li> <li>• machine specific corrections</li> </ul> This a multi-value attribute, the first value specifies the mass factor for a small patient size, the second value for a medium patient size and the third value for a large patient size. See C.8.2.1.1.7.
Energy Weighting Factor	(0018,9353)	1C	The weighting factor of the data from the primary source in a multiple energy composition image. This factor incorporates the effects of <ul style="list-style-type: none"> <li>• the specific X-Ray source and kV value</li> <li>• examination specific characteristics.</li> </ul> Required if one Derivation Code Sequence (0008,9215) Item value is (113097, DCM, "Multi-energy proportional weighting"). May be present otherwise.
CT Additional X-Ray Source Sequence	(0018,9360)	3	Contains the attributes describing additional acquisition parameters beyond the primary source in a multiple X-Ray source system or a multi-energy

			acquisition. The primary X-Ray source is specified in other attributes of this module. One or more Items are permitted in this sequence.
>kVP	(0018,0060)	1	Peak kilo voltage output of the X-Ray generator used.
>X-Ray Tube Current in mA	(0018,9330)	1	Nominal X-Ray tube current in milliamperes.
>Data Collection Diameter	(0018,0090)	1	The diameter in mm of the region over which data were collected.
>Focal Spot(s)	(0018,1190)	1	Used nominal size of the focal spot in mm.
>Filter Type	(0018,1160)	1	Type of filter(s) inserted into the X-Ray beam.
>Filter Material	(0018,7050)	1	The X-Ray absorbing material used in the filter.
>Exposure in mAs	(0018,9332)	3	The exposure expressed in milliamperere seconds, for example calculated from exposure time and X-Ray tube current.
>Energy Weighting Factor	(0018,9353)	1C	The weighting factor of the data from this additional source in a multiple energy composition image. This factor incorporates the effects of <ul style="list-style-type: none"> <li>• the specific X-Ray source and kV value</li> <li>• examination specific characteristics.</li> </ul> <p>Required if one Derivation Code Sequence (0008,9215) Item value is (113097, DCM, "Multi-energy proportional weighting"). May be present otherwise.</p>

### C.8.2.1.1 CT Image Attribute Descriptions

#### C.8.2.1.1.1 Image Type

For CT Images, Image Type (0008,0008) is specified to be Type 1 and uses one of the following Defined Terms for Value 3:

AXIAL identifies a CT Axial Image  
LOCALIZER identifies a CT Localizer Image

Note: Axial in this context means any cross-sectional image, and includes transverse, coronal, sagittal and oblique images.

#### C.8.2.1.1.2 Samples Per Pixel

For CT Images, Samples per Pixel (0028,0002) shall have an Enumerated Value of 1.

**C.8.2.1.1.3 Photometric Interpretation**

For CT Images, Photometric Interpretation (0028,0004) shall have one of the following Enumerated Values:

MONOCHROME1  
MONOCHROME2

See C.7.6.3.1.1.2 for definition of these terms.

**C.8.2.1.1.4 Bits Allocated**

For CT Images, Bits Allocated (0028,0100) shall have the Enumerated Value of 16.

**C.8.2.1.1.5 Bits Stored**

For CT Images, Bits Stored (0028,0101) shall have the Enumerated Values of 12 to 16.

**C.8.2.1.1.6 High Bit**

For CT Images, High Bit (0028,0102) shall have only the Enumerated Value of one less than the value sent in Bits Stored.

**C.8.2.1.1.7 Calcium Scoring Mass Factor Patient and Calcium Scoring Mass Factor Device**

The calibration factors for the Calcium Scoring Mass Factor Patient (0018,9351) and Calcium Scoring Mass Factor Device (0018,9352) attributes are defined by the International Consortium for Multi-Detector CT Evaluation of Coronary Calcium, see McCollough, C.H. "A multi-institutional, multi-manufacturer, international standard for the quantification of coronary artery calcium using cardiac CT".