

DICOM Correction Item

Correction Number		CP-666
Log Summary: Gated Cardiac and Respiratory synchronization in enhanced IODs		
Type of Modification	Name of Standard	
Addition	PS 3.3, 3.6 2007, Supplements 116, 117	
Rationale for Correction		
<p>(1) It is highly desirable that the gating support should be consistent across all of the Enhanced IODs. Therefore, the following proposal changes to the existing gating entities, namely the Cardiac Synchronization Module, the Respiratory Synchronization Module, the Cardiac Trigger Macro, and the Respiratory Trigger Macro that are a part of all of the Enhanced IODs. These changes are structured such that they are optional additions to the existing Enhanced IODs, but can be mandatory for PET and other future IODs. The benefits of extending gating capabilities, and maintaining consistency among all of the Enhanced IODs will outweigh the impact of changing the existing IOD definitions and any existing implementation of these IODs.</p> <p>(2) The cardiac timing information used in the enhanced CT, MR and XA/XRF IODs does not make it entirely clear that the trigger delay time is intended to be a nominal value as opposed to the actual time within the cardiac cycle at which the frame was acquired. This is particularly important for retrospectively rather than prospectively gated acquisitions, since the actual acquisition time may not occur at precisely the prescribed time after the preceding R peak, but rather within some window close to the prescribed time.</p> <p>This nominal information is potentially more useful to a receiver than the absolute value of the trigger offset from the R-peak when trying to group together frames nominally acquired at the same position of the cardiac cycle, and in particular for use as the index of a dimension.</p> <p>However, if the existing attribute is intended to be the nominal time, then there is currently no means of encoding the actual time from the previous R-peak. There is also no means of encoding the tolerance (width of the window) during which actual acquisition times are accepted as being at the nominal time.</p> <p>It is also important to clarify how the nominal “trigger delay time” can be expressed to the user as a percentage of the cardiac cycle, which is a value that is independent of the patient’s heart rate (R-R interval).</p>		
Sections of documents affected		
PS 3.3 Section A.36.2.4, A.36.3.4 A.38.4.1 A.47.4, A.48.4, C.7.6.16.2.2, C.7.6.16.2.7, C.7.6.16.2.17, C.7.6.18.1, C.7.6.18.2, C.8.4.13, C.8.9.3, C.8.9.4.1.3, PS 3.6 Section 6, Supplement 116 A.X.4 and Supplement 117 A.X.1.4		
Correction Wording:		

Change Functional Group Table in PS 3.3 A.36.2.4, A.36.3.4 A.38.4.1 A.47.4 and A.48.4

A.36.2.4 Enhanced MR Image Functional Group Macros

Table A.36-2 specifies the use of the Functional Group macros used in the Multi-frame Functional Groups Module for the Enhanced MR Image IOD.

**Table A.36-2
 ENHANCED MR IMAGE FUNCTIONAL GROUP MACROS**

Functional Group Macro	Section	Usage
...		
Cardiac <u>TriggerSynchronization</u>	C.7.6.16.2.7	C - Required if Cardiac Synchronization Technique (0018,9037) equals other than NONE and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.
...		
Respiratory <u>TriggerSynchronization</u>	C.7.6.16.2.17	C – Required if Respiratory Motion Compensation Technique (0018,9170) equals other than NONE, REALTIME or BREATH_HOLD and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.
...		

A.36.3.4 MR Spectroscopy Functional Group Macros

Table A.36-4 specifies the use of the Functional Group macros used in the Multi-frame Functional Groups Module for the MR Spectroscopy IOD.

**Table A.36-4
 MR SPECTROSCOPY FUNCTIONAL GROUP MACROS**

Functional Group Macro	Section	Usage
...		
Cardiac <u>TriggerSynchronization</u>	C.7.6.16.2.7	C - Required if Cardiac Synchronization Technique (0018,9037) equals other than NONE and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.
...		
Respiratory <u>TriggerSynchronization</u>	C.7.6.16.2.17	C – Required if Respiratory Motion Compensation Technique (0018,9170) equals other than NONE, REALTIME or BREATH_HOLD and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.
...		

A.38.1.4 Enhanced CT Image Functional Group Macros

Table A.38-2 specifies the use of the Functional Group macros used in the Multi-frame Functional Group Module for the Enhanced CT Image IOD.

**Table A.38-2
 ENHANCED CT IMAGE FUNCTIONAL GROUP MACROS**

Functional Group Macro	Section	Usage
...		
Cardiac Trigger <u>Synchronization</u>	C.7.6.16.2.7	C - Required if Cardiac Synchronization Technique (0018,9037) equals other than NONE and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.
...		
Respiratory Trigger <u>Synchronization</u>	C.7.6.16.2.17	C – Required if Respiratory Motion Compensation Technique (0018,9170) equals other than NONE, REALTIME or BREATH_HOLD and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.
...		

A.47.4 Enhanced XA Image Functional Group Macros

Table A.47-2 specifies the use of the Functional Group macros used in the Multi-frame Functional Groups Module for the Enhanced XA Image IOD.

**Table A.47-2
 ENHANCED XA IMAGE FUNCTIONAL GROUP MACROS**

Functional Group Macro	Section	Usage
...		
Cardiac Trigger <u>Synchronization</u>	C.7.6.16.2.7	U
...		
Respiratory Trigger <u>Synchronization</u>	C.7.6.16.2.17	U
...		

A.48.4 Enhanced XRF Image Functional Group Macros

Table A.48-2 specifies the use of the Functional Group macros used in the Multi-frame Functional Groups Module for the Enhanced XRF Image IOD.

**Table A.48-2
 ENHANCED XRF IMAGE FUNCTIONAL GROUP MACROS**

Functional Group Macro	Section	Usage
...		
Cardiac TriggerSynchronization	C.7.6.16.2.7	U
...		
Respiratory TriggerSynchronization	C.7.6.16.2.17	U
...		

Change Functional Group Table in Supplement 116 A.X.4

A.X.4 X-Ray 3D Angiographic Image Functional Group Macros

Table A.X-2 specifies the use of the Functional Group macros used in the Multi-frame Functional Groups Module for the X-Ray 3D Angiographic Image IOD.

**Table A.X-2
 X-RAY 3D ANGIOGRAPHIC IMAGE FUNCTIONAL GROUP MACROS**

Functional Group Macro	Section	Usage
...		
Cardiac TriggerSynchronization	C.7.6.16.2.7	U
...		
Respiratory TriggerSynchronization	C.7.6.16.2.17	U
...		

Change Functional Group Table in Supplement 117 A.X.1.4

A.X.1.4 Enhanced PET Image Functional Group Macros

Table A.X-2 specifies the use of the Functional Group macros used in the Multi-frame Functional Group Module for the Enhanced PET Image IOD.

**Table A.X-2
 ENHANCED PET IMAGE FUNCTIONAL GROUP MACROS**

Function Group Macro	Section	Usage
...		

Cardiac TriggerSynchronization	C.7.6.16.2.7	C – Required if Cardiac Synchronization Technique (0018,9037) equals other than NONE. May be present otherwise.
Respiratory TriggerSynchronization	C.7.6.16.2.17	C – Required if Respiratory Motion Compensation Technique (0018,9170) equals other than NONE. May be present otherwise.
...		

Amend PS 3.3, Section C.7.6.16.2.2.2

C.7.6.16.2.2.2 Frame Reference Datetime

The Frame Reference Datetime (0018,9151) is used to indicate the point in time that is most representative for that specific frame.

Notes: 1. For example, in the case of MR it might be the time of acquisition of the data for the $k_y=0$ line in k-space (the central Fourier segment).

2. For cardiac gated acquisitions the choice of the Frame Reference Datetime (0018,9151) is influenced by the Nominal Cardiac Trigger Delay Time (0020,9153). For respiratory gated acquisitions the choice of the Frame Reference Datetime (0018,9151) is influenced by the Nominal Respiratory Trigger Delay Time (0020,9255).

Amend PS 3.3, Section C.7.6.16.2.7

C.7.6.16.2.7 Cardiac TriggerSynchronization Macro

Table C.7.6.16-8 specifies the attributes of the Cardiac **TriggerSynchronization** Functional Group macro.

**Table C.7.6.16-8
 CARDIAC TRIGGERSYNCHRONIZATION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Cardiac TriggerSynchronization Sequence	(0018,9118)	1	Identifies cardiac trigger delay for this frame. Sequence that describes the frame specific cardiac synchronization parameters. Only a single Item shall be permitted in this sequence.
>Nominal Percentage of Cardiac Phase	(0020,9241)	1C	The nominal time relative to the preceding R peak divided by the nominal R-R interval multiplied by 100. Required if used as a dimension index, may be present otherwise.

> Nominal Cardiac Trigger Delay Time	(0020,9153)	1	The nominal Trigger delay time in ms from the time of the previous R-peak to the value of the Frame Reference Datetime (0018,9151). See C.7.6.16.2.7.1 for further explanation.
> Actual Cardiac Trigger Delay Time	(0020,9252)	1C	The actual time in ms from the time of the previous R-peak to the value of the Frame Reference Datetime (0018,9151). See C.7.6.16.2.7.1 for further explanation. Required if Intervals Acquired (0018,1083) is present and has a value of 1. May be present otherwise.
> Intervals Acquired	(0018,1083)	3	Number of R-R intervals acquired.
> Intervals Rejected	(0018,1084)	3	Number of R-R intervals rejected.
> Heart Rate	(0018,1088)	3	Average number of heart beats per minute for the collection period for this frame. This shall include all accepted beats as well as rejected beats. Note: During prolonged acquisitions the average heart rate may differ from the reciprocal of the nominal R-R interval.
>R – R Interval Time MeasuredNominal	(0020,9251)	1C	MeasuredNominal R-peak – R-peak interval time in ms for the cardiac cycles in which this frame occurs used for the acquisition of this frame . See C.7.6.16.2.7.1 for further explanation. Required if Cardiac Synchronization Technique (0018,9037) equals other than NONE or REALTIME. May be present otherwise.
> Low R-R Value	(0018,1081)	3	R-R interval low limit for beat rejection, in ms.
> High R-R Value	(0018,1082)	3	R-R interval high limit for beat rejection, in ms.

C.7.6.16.2.7.1 Relationship of Cardiac Timing Attributes

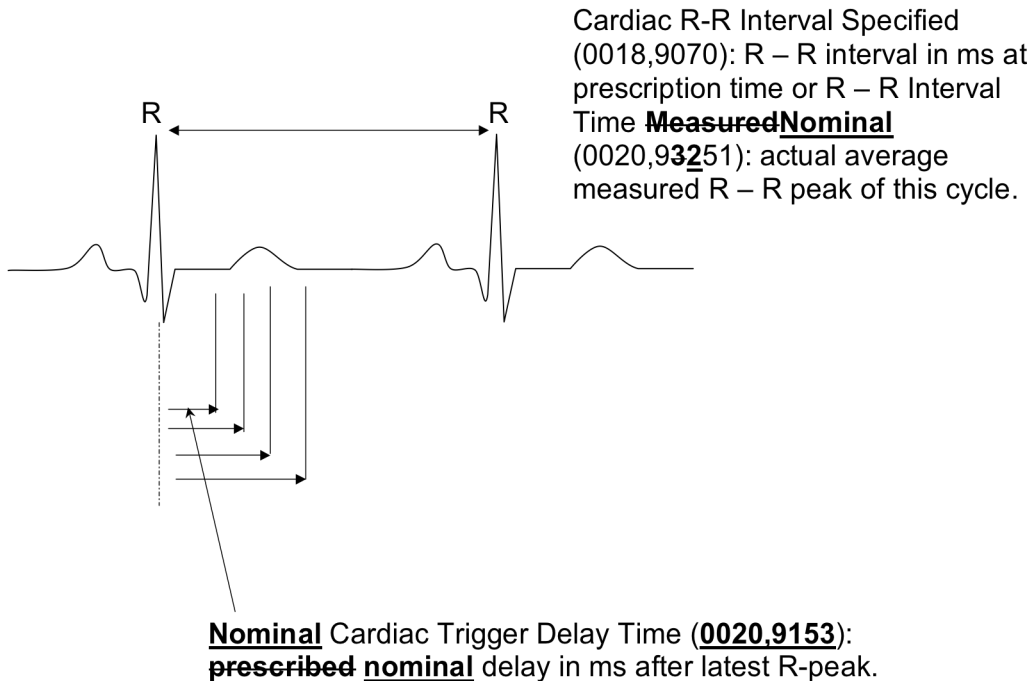
The Nominal Cardiac Trigger Delay Time (0020,9153) is the nominal trigger delay time in ms from the previous R-peak to the value of the Frame Reference Datetime (0018,9151). When frames are acquired with prospective gating, that is, the data acquisition actually begins in response to a timed delay from the R-peak, it may be that Actual Cardiac Trigger Delay Time (0020,9252) and the Nominal Cardiac Trigger Delay Time (0020,9153) have the same value.

However, when frames are the result of retrospective gating, that is, the data is continuously acquired and then later compared with a simultaneously acquired ECG waveform and fitted into time slots corresponding to nominal phases of the cardiac cycle, then Nominal Cardiac Trigger Delay Time (0020,9153) and the Actual Cardiac Trigger Delay Time (0020,9252) may have different values.

When multiple cardiac cycles are averaged together, then the Low R-R Value (0018,1081), and High R-R Value (0018,1082) are an average of the cardiac cycles that were accepted in the frame.

Note: For cardiac gated acquisitions the choice of the Frame Reference Datetime (0018,9151) is influenced by the Nominal Cardiac Trigger Delay Time (0020,9153). For respiratory gated acquisitions the choice of the Frame Reference Datetime (0018,9151) is influenced by the Nominal Respiratory Trigger Delay Time (0020,9255).

Figure C.7.6.16-5 depicts the usage.



**Figure C.7.6.16-5
Cardiac Timing Tags**

Amend PS 3.3, Section C.7.6.16.2.17

C.7.6.16.2.17 Respiratory TriggerSynchronization Macro

Table C.7.6.16-18 specifies the attributes of the Respiratory ~~Trigger~~Synchronization Functional Group macro.

**Table C.7.6.16-18
RESPIRATORY TRIGGER~~SYNCHRONIZATION~~ MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Respiratory Trigger <u>Synchronization</u> Sequence	(0020,9253)	1	Identifies respiratory trigger delay for this frame <u>Sequence that describes the frame specific respiratory synchronization parameters.</u> Only a single Item shall be permitted in this sequence.
>Respiratory Interval Time	(0020,9254)	1 <u>C</u>	Average measured interval time in ms from one respiratory trigger to the next trigger for the respiratory cycles in which this frame occurs. See C.7.6.16.2.17.1 for further explanation. Required if Respiratory Motion Compensation Technique (0018,9170)) equals other than NONE or REALTIME, and Respiratory Signal Source (0018,9171) is BELT <u>Respiratory Trigger Type (0020,9250) is absent or has a value of TIME or BOTH. May be present otherwise.</u>
> <u>Nominal Percentage of Respiratory Phase</u>	(0020,9245)	1 <u>C</u>	<u>The nominal time relative to the preceding respiratory inspiration maximum divided by the nominal respiratory interval multiplied by 100.</u> <u>Required if used as a dimension index, may be present otherwise.</u>
> <u>Nominal</u> Respiratory Trigger Delay Time	(0020,9255)	1	The nominal <u>Trigger delay</u> time in ms from the time defined by value of Respiratory Trigger Delay Threshold (0020,9256) following the previous maximum value of respiration, from the beginning of the respiratory interval to the value of the Frame Reference Datetime (0018,9151). See C.7.6.16.2.17.1 for further explanation.
> <u>Actual Respiratory Trigger Delay Time</u>	(0020,9257)	1 <u>C</u>	<u>The actual time in ms from the beginning of the respiratory interval to the value of the Frame Reference Datetime (0018,9151). See C.7.6.16.2.17.1 for further explanation.</u> <u>Required if Respiratory Trigger Type (0020,9250) is TIME or BOTH.</u>

>Starting Respiratory Amplitude	(0020,9246)	1C	Nominal amplitude of the respiratory signal at which the acquisition of data for this frame begins, in percent of the nominal maximum value (which represents maximum inspiration). Required if Respiratory Trigger Type (0020,9250) is AMPLITUDE or BOTH.
>Starting Respiratory Phase	(0020,9247)	1C	The phase of respiration at which the Starting Respiratory Amplitude (0020,9246) was measured. Enumerated Value: _____ INSPIRATION _____ MAXIMUM _____ EXPIRATION _____ MINIMUM Required if Starting Respiratory Amplitude (0020,9246) is present.
>Ending Respiratory Amplitude	(0020,9248)	1C	Nominal amplitude of the respiratory signal at which the acquisition of data for this frame ends, in percent of the nominal maximum value (which represents maximum inspiration). Required if Respiratory Trigger Type (0020,9250) is AMPLITUDE or BOTH.
>Ending Respiratory Phase	(0020,9249)	1C	The phase of respiration at which the Ending Respiratory Amplitude (0020,9248) was measured. Enumerated Value: _____ INSPIRATION _____ MAXIMUM _____ EXPIRATION _____ MINIMUM Required if Ending Respiratory Amplitude (0020,9248) is present.

C.7.6.16.2.17.1 Relationship of Respiratory Timing Attributes

For time based respiratory gating, the Nominal Respiratory Trigger Delay Time (0020,9255) is the prescribed trigger delay time in ms from the previous Respiratory-peak to the value of the Frame Reference Datetime (0018,9151). When frames are acquired with prospective gating, that is, the data acquisition actually begins in response to a timed delay from the Respiratory trigger, it may be that Actual Respiratory Trigger Delay Time (0020,9257) and the Nominal Respiratory Trigger Delay Time (0020,9255) have the same value.

However, when frames are the result of retrospective gating, that is, the data is continuously acquired and then later compared with a simultaneously acquired respiratory waveform and fitted into bins corresponding to nominal phases of the respiratory cycle, then Nominal Respiratory Trigger Delay Time (0020,9255) and the Actual Respiratory Trigger Delay Time (0020,9257) may have different values.

Figure C.7.6.16-9a and C.7.19-9b depicts the usage.

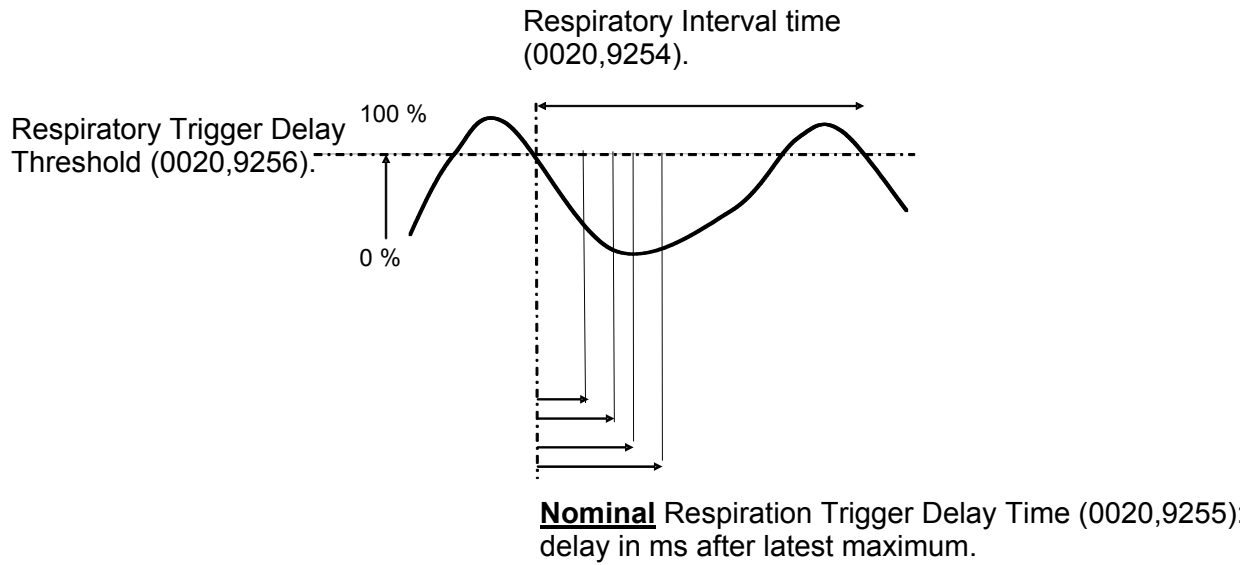


Figure C.7.6.16-9a
Respiratory Timing Tags

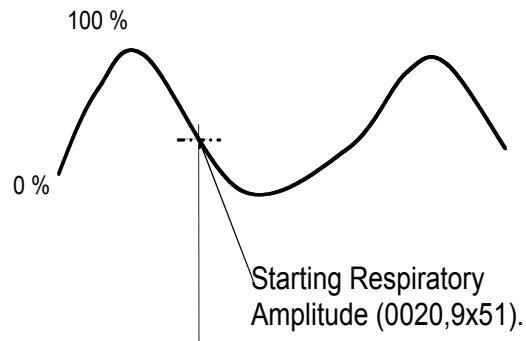


Figure C.7.6.16-9b
Relationship of Respiratory Amplitude Attributes

Amend PS 3.3, Section C.7.6.18.1

C.7.6.18.1 Cardiac Synchronization Module

Table C.7.6.18-1 specifies the attributes of the Cardiac Synchronization Module.

**Table C.7.6.18-1
 CARDIAC SYNCHRONIZATION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Cardiac Synchronization Technique	(0018,9037)	1C	Defines if a cardiac synchronization technique was applied during or after the acquisition. Enumerated Values: NONE REALTIME = total time for the acquisition is shorter than cardiac cycle, no gating is applied PROSPECTIVE = certain thresholds have been set for a gating window that defines the acceptance of measurement data during the acquisition RETROSPECTIVE = certain thresholds have been set for a gating window that defines the acceptance of measurement data after the acquisition PACED = there is a constant RR interval (e.g., Pacemaker), which makes thresholding not required Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.

Cardiac Signal Source	(0018,9085)	1C	<p>Cardiac Signal Source.</p> <p>Defined Terms:</p> <p>ECG = electrocardiogram VCG = vector cardiogram PP = peripheral pulse MR = magnetic resonance, i.e. M-mode or cardiac navigator</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p>
Cardiac RR Interval Specified	(0018,9070)	1C	<p>R-R interval in ms measured prior to or during the scan.</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p> <p>Note: <u>The Heart Rate (0018,1088) attribute is not used in this Module, since its value can be derived as 1/ Cardiac RR Interval Specified (0018,9070).</u></p>

Cardiac Beat Rejection Technique	(0018,9169)	1C	<p>Cardiac arrhythmia rejection technique.</p> <p>Defined Terms: NONE RR_INTERVAL = rejection based on deviation from average RR interval QRS_LOOP = rejection based on deviation from regular QRS loop PVC = rejection based on PVC criteria</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals PROSPECTIVE or RETROSPECTIVE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals PROSPECTIVE or RETROSPECTIVE.</p>
Low R-R Value	(0018,1081)	2C	<p>R-R interval low limit for beat rejection, in ms.</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals PROSPECTIVE or RETROSPECTIVE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals PROSPECTIVE or RETROSPECTIVE.</p>
High R-R Value	(0018,1082)	2C	<p>R-R interval high limit for beat rejection, in ms.</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals PROSPECTIVE or RETROSPECTIVE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals PROSPECTIVE or RETROSPECTIVE.</p>

Intervals Acquired	(0018,1083)	2C	<p>Number of R-R intervals acquired <u>and used to create the image (not including the intervals rejected).</u></p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p>
Intervals Rejected	(0018,1084)	2C	<p>Number of R-R intervals rejected.</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Cardiac Synchronization Technique (0018,9037) equals other than NONE.</p>
Skip Beats	(0018,1086)	3	Number of beats prescribed to be skipped after each detected arrhythmia.
Cardiac Framing Type	(0018,1064)	1C	<p>Description of type of framing performed. Defined Terms:</p> <p><u>FORW = time forward from trigger</u></p> <p><u>BACK = time back before trigger</u></p> <p><u>PCNT = percentage of R-R forward from trigger</u></p> <p><u>See C.7.6.18.1.1.1.</u></p> <p>Required if type of framing is not time forward from trigger, may be present otherwise.</p>

Note: Low R-R Value (0018,1081), High R-R Value (0018,1082), Intervals Acquired (0018,1083) and Intervals Rejected (0018,1084) in this Module apply to the entire Image. The Cardiac Gating Sequence (0018,9118) in the Cardiac Gating Functional Group uses the same attributes and specifies the values for a single frame.

C.7.6.18.1.1 Attribute Descriptions

C.7.6.18.1.1.1 Cardiac Framing Type

Cardiac Framing Type (0018,1064) is the mechanism used to select the data acquired to construct the frames within a specified cardiac timing interval.

Amend PS 3.3, Section C.7.6.18.1

C.7.6.18.2 Respiratory Synchronization Module

Table C7.6.18-2 specifies the attributes of the Respiratory Synchronization Module.

**Table C.7.6.18-2
 RESPIRATORY SYNCHRONIZATION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Respiratory Motion Compensation Technique	(0018,9170)	1C	Applied technique to reduce respiratory motion artifacts. Defined Terms: NONE BREATH_HOLD REALTIME = image acquisition shorter than respiratory cycle GATING = Prospective gating TRACKING = prospective through-plane or in-plane motion tracking PHASE_ORDERING = prospective phase ordering PHASE_RESCANNING = prospective techniques, such as real-time averaging, diminishing variance and motion adaptive gating RETROSPECTIVE = retrospective gating CORRECTION = retrospective image correction Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.

Respiratory Signal Source	(0018,9171)	1C	<p>Signal source from which respiratory motion is derived.</p> <p>Defined Terms:</p> <p>NONE</p> <p>BELT _____ = <u>includes various devices that detect or track expansion of the chest.</u></p> <p>NASAL_PROBE</p> <p>CO2_SENSOR</p> <p>NAVIGATOR = MR navigator and organ edge detection</p> <p>MR_PHASE = phase (of center k-space line)</p> <p>ECG = baseline demodulation of the ECG</p> <p>Required if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED and Respiratory Motion Compensation Technique (0018,9170) equals other than NONE.</p> <p>Otherwise may be present if Image Type (0008,0008) Value 1 is DERIVED and Respiratory Motion Compensation Technique (0018,9170) equals other than NONE.</p>
Respiratory Trigger Delay Threshold	(0020,9356)	1C	<p>Respiratory trigger threshold in percent of the chest expansion for the frame relative to the last Respiratory Peak. See C.7.6.16.2.17.1 for further explanation.</p> <p>Required if Respiratory Motion Compensation Technique (0018,9170) equals other than NONE, REALTIME, or BREATH_HOLD and if Image Type (0008,0008) Value 1 is ORIGINAL or MIXED. May be present otherwise.</p>
<u>Respiratory Trigger Type</u>	<u>(0020,9250)</u>	<u>1C</u>	<p><u>Characteristic of the respiratory signal used to define the respiratory triggering.</u></p> <p><u>Defined Terms:</u></p> <p>_____ <u>TIME</u></p> <p>_____ <u>AMPLITUDE</u></p> <p>_____ <u>BOTH</u></p> <p><u>Required if the value is not TIME, may</u></p>

		be present otherwise.
--	--	------------------------------

Change attribute name in Section C.8.4.13

C.8.4.13 NM Multi-gated Acquisition Module

Table C.8-13 contains Attributes that describe a multi-gated acquisition image performed on the patient. This refers to frames acquired while the patient is connected to a gating device.

**Table C.8-13
 NM MULTI-GATED ACQUISITION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
...			
> Cardiac Framing Type	(0018,1064)	3	Description of type of framing performed such as forward, backward, forward/backward by percentage. See C.7.6.18.1.1.1.
...			

Change attribute name in Section C.8.9.3

C.8.9.3 PET Multi-gated Acquisition Module

Table C.8-62 contains IOD Attributes that describe a PET Multi-gated Acquisition.

Table C.8-62 - PET MULTI-GATED ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
...			
Cardiac Framing Type	(0018,1064)	3	Description of type of framing performed. Defined Terms: FORW = forward BACK = backward PCNT = forward/backward by percentage See C.7.6.18.1.1.1.

Change attribute name in Section C.8.9.4.1.3

C.8.9.4.1.3 Frame Time

The Frame Time (0018,1063) is the explicit duration of the gated frame when **Cardiac** Framing Type (0018,1064) is equal to FORW or BACK. Frame Time (0018,1063) is the nominal duration of the gated frame when **Cardiac** Framing Type (0018,1064) is equal to PCNT.

Amend and add data elements in PS 3.6, Section 6

Tag	Name	VR	VM
(0018,1064)	Cardiac Framing Type	LO	1
(0018,9118)	Cardiac Trigger Synchronization Sequence	SQ	1

Tag	Name	VR	VM
(0020,9153)	Nominal Cardiac Trigger Delay Time	FD	1
(0020,9251)	R – R Interval Time Measured Nominal	FD	1
(0020,9253)	Respiratory Trigger Synchronization Sequence	SQ	1
(0020,9255)	Nominal Respiratory Trigger Delay Time	FD	1

Tag	Name	VR	VM
<u>(0020,9241)</u>	<u>Nominal Percentage of Cardiac Phase</u>	<u>FL</u>	<u>1</u>
<u>(0020,9245)</u>	<u>Nominal Percentage of Respiratory Phase</u>	<u>FL</u>	<u>1</u>
<u>(0020,9246)</u>	<u>Starting Respiratory Amplitude</u>	<u>FL</u>	<u>1</u>
<u>(0020,9247)</u>	<u>Starting Respiratory Phase</u>	<u>CS</u>	<u>1</u>
<u>(0020,9248)</u>	<u>Ending Respiratory Amplitude</u>	<u>FL</u>	<u>1</u>
<u>(0020,9249)</u>	<u>Ending Respiratory Phase</u>	<u>CS</u>	<u>1</u>
<u>(0020,9250)</u>	<u>Respiratory Trigger Type</u>	<u>CS</u>	<u>1</u>
<u>(0020,9252)</u>	<u>Actual Cardiac Trigger Delay Time</u>	<u>FD</u>	<u>1</u>
<u>(0020,9257)</u>	<u>Actual Respiratory Trigger Delay Time</u>	<u>FD</u>	<u>1</u>